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WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER
LOCAL PROTECTION

CONNECTICUT RIVER BASIN
HARTFORD, CONNECTICUT

DESIGN MEMORANDUM NO. 2

PHASE I

PLAN FORMULATION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

MARCH 1973

46

DAEN-CWP-E (30 Mar 73) 3rd Ind
SUBJECT: Park River Local Protection, Connecticut River Basin, Hartford, Conn. Design Memorandum No. 2, Phase I- Plan Formulation

DA, Office of the Chief of Engineers, Washington, D. C. 20314 16 May 74

TO: Division Engineer, New England, ATTN: NEDED-R

Approved.

FOR THE CHIEF OF ENGINEERS:

Norman E. Jackson
for IRWIN REISLER
Chief, Planning Division
Directorate of Civil Works
Atlantic

Incl wd

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SUBJECT: Park River Local Protection, Connecticut River Basin, Hartford, Conn., Design Memorandum No. 2, Phase I - Plan Formulation

8. Par. 1.f. - Underpinning of Buildings

The estimated $75,000 for underpinning and protection of buildings during construction of the auxiliary conduit appears justified based on information available at present. Possible damage to buildings as a result of the construction works for causes other than the effects of lowering the water table has been studied. The anticipated construction procedures are sheeted trench construction, tunneling in earth, and tunneling in rock. Present indications are that earth tunneling will be through glacial till and that all nearby buildings are founded on till. Three buildings appear close enough to the proposed alignment of the auxiliary conduit to require protection. Settlement monitoring of the existing structures including the piers of the highway overpass will be provided. With reasonable construction care, it is expected that bracing of the overpass piers will not be required or that damage will not occur to buildings.

9. Review and approval of the above comments are requested.

FOR THE DIVISION ENGINEER:

Meyer S Slotkin

1 Incl
Incl 1 wd
Added:
2. as

MEYER S. SLOTKIN
Acting Chief, Engineering Division

Final use will be determined by additional meetings and coordination with local interests during the detailed design stage.

6. Par. 1d. - Removal and Replacement of Utilities.

The estimated cost of $60,000 shown on page B-8 is for removal and replacement of existing utilities which are integral parts of the excavation works required for construction of the conduit sections at the roadway crossings. The $900,000 and $60,000 shown on page B-9 are estimated costs for removal and replacement of utilities, pavements and sidewalks which are integral parts of the open excavation works required for construction of the auxiliary conduit along the roadways. EM 1120-2-101, Par. 1-84g., states that all changes in public utilities must be made and paid for by local interests "except those parts which are to pass beneath, through, or over the project structure and which, if ruptured would cause adverse effects to the project structures." "Such excepted parts will be designed and constructed at Federal cost to avoid damage to project structures or loss of protection."

7. Par. 1.e. - Reimbursement Agreement

By letter dated 9 May 1972, the Greater Hartford Flood Commission (GHFC) requested "Certification of Work Performed" under paragraph 8 of the reimbursement agreement for accomplishment of certain flood protection work related to the authorized Park River project. The GHFC realizes that the sum of $128,300 for the pilot channel work is not eligible for reimbursement because the work was done prior to the formal agreement. However, after the formal agreement was signed on 1 July 1969, the work accomplished by contract consisted of the removal of trees within the area to be occupied by the proposed flood control box-conduit. The cost for this work is $13,100.

The matter of certification and reimbursement for removal of the trees was discussed on 23 August 1972 with Mr. Robert J. Robertory, Office of General Counsel, OCE. At that time it was not certain whether the cost for removal of trees accomplished as part of the work described in the agreement is reimbursable since the agreement does not provide for reimbursement for partial performance. However, when construction funds are available and the project is undertaken, the matter will be presented in detail to OCE for final determination. This information was transmitted by letter dated 23 August 1972 to the GHFC.

Local dissatisfaction could easily focus on the Corps for ignoring these consequences in its planning. Demands for flood protection would be likely, adding to the expense of the project. Finally, increased susceptibility to flooding may lower real estate and rental values and hasten changes in the composition of the neighborhood.

Inclosed are 20 copies of Plate 2-5 showing the revised location of the headwall and conduit extension (Section 9). This change in the scope of work decreases the cost of the Section 9 conduit extension and the total project cost by an estimated $2.4 million. Subsequent to approval, revisions to the project plan and detailed costs will be presented in the Phase II - Project Design, General Design Memorandum.

4. Par. 1.b. - Riverside Pumping Station

Comments concerning the proposed Riverside pumping station are further discussed in 2nd Indorsement dated 15 November 1973 to HQDA (DAEN-CWE-B), and 3rd Indorsement dated 3 January 1974 to NEDED-W. As noted in the 3rd Indorsement, additional information determining the need and size of the pumping station will be provided in the Phase II - General Design Memorandum. Data concerning the Armory Pumping Station also will be included.

5. Par. 1.c. Parking Facilities

Benefits claimed for the parking facilities were derived by the same approach as was used in the authorizing document. The current results represent an increase of 43% over the $0.70 per square foot (1965 price level) used in that document. The $0.70 was a net benefit, the gross being $1.14 per square foot including amortization, maintenance and policing. A 43% increase for the price level during the period 1965-1973 is believed to be conservative.

Alternatives to the proposed parking over the Park River conduit were discussed in general in Paragraph 28 of the Phase I report, Public Use and Environmental Aspects. As noted, the final design of the conduit and the final cross-sections of the right-of-way with the conduit in place are limiting factors in determining the final use for the areas. Parking facilities are urgently needed in the areas as described on page 48 of the report. The City of Hartford is currently using part of the area over the existing conduit for parking as well as some areas for public use activities.

originally proposed or revised conduit extension (Section 9) due to the rarity of the event, the flood control improvements would prevent flooding and damages to the heavily traveled Farmington Avenue roadway and to the developed urban properties along the north side of Farmington Avenue. The major benefits supporting the need for Section 9 and for providing the 285-foot conduit extension as an integral part of the project are based primarily on the elimination of the adverse social and environmental effects that would be propagated by the construction of the headwall on the south side of Farmington Avenue.

The social and economic benefits of the revised extension are best displayed by considering the consequences of going ahead with the authorized plan. In addition to the discussion included in Section I, Plan Formulation, on pages 26 through 29 of the report, the construction of the headwall along the south side of Farmington Avenue has two other major adverse effects. First, a headwall approximately 4 to 4-1/2 feet above ground extending for an entire city block would be required for closure. This headwall would not only detract from the general appearance of the area but more importantly would contribute to a "walled-in" concrete atmosphere in an urban setting which has little green or open space. Second, as indicated in the report, during flood conditions the headwall would function as a dam, increasing the height of flood waters which affect Farmington Avenue itself and the housing units immediately north of Farmington Avenue. The consequences of such flooding are important because of the large numbers of persons who use Farmington Avenue as an access route. On a typical average day over 1,600 cars travel along Farmington Avenue during the peak hours, once in the morning and again in the evening. Bus lines on Farmington Avenue link the areas of West Hartford Center, Webster Hill, Albany Place, Unionville and Bishop's Corner to the center of Hartford. Bus service is available every 10 minutes in each direction on Farmington Avenue. Higher flood waters would disrupt this traffic, interfering with the every-day economic and social activities of a large number of people.

In addition, the residents in the area already perceive their neighborhood as one threatened by change. Failure to provide equal protection to both sides of Farmington Avenue is likely to increase tensions in the area and disturb community relations. The presence of a structure which visibly protects one side of the street while the other side becomes more susceptible to flooding will undoubtedly result in angry questions.

the recommended plan affords the optimum enhancement of the environment, social well-being and economic growth in the metropolitan Hartford areas.

Experienced flood losses, updated potential flood damages and the major intangible benefits to be realized by construction of the recommended plan are stated in Section N of the report. Since the total tangible flood control benefits exceed the total project costs, no further analysis is required.

3. Par. 1.a. Farmington Avenue Conduit Extension

At the request of Hartford City officials, a meeting was held in Hartford on 1 November 1973 to discuss the conduit extension (Section 9). The Deputy Mayor of Hartford stated that local ecological and neighborhood associations including the West End Civic Group, are opposed to plans which eliminate the large ox-bow turn of the North Branch Park River and alter the adjacent land from its present natural condition. All land abutting the river is privately owned but the public uses it for nature walks and aesthetic values as it is one of the few natural areas remaining in this densely urbanized city. Hartford City officials again expressed the need for extending the conduit north of Farmington Avenue and requested a solution to resolve the flood problem and to satisfy other local interests.

Coincidentally, topographic field survey maps prepared by this office for project detailed design were complete at this time providing detailed information not available during the preparation of the Phase I - Plan Formulation Report. A study of the recently completed topographic maps including contours at one-foot intervals revealed that the headwall for Section 9 could meet high ground at a site approximately 135 feet north of the Farmington Avenue Bridge. This site decreases the length of conduit Section 9 from 935 feet to about 285 feet as measured from the upstream end of the existing conduit Section 8. Local officials indicated that the new location for the headwall is favorable, meets with their desires and satisfies the needs of local ecological and environmental groups.

The construction of the Farmington Avenue conduit extension as revised and noted above, is recommended to provide local protection works with emphasis on the engineering integrity and feasibility of the improvements. Although an incremental economic analysis would not support the

NEDED-R(30 March 73) 2nd Ind
SUBJECT: Park River Local Protection, Connecticut River Basin, Hartford, Conn., Design Memorandum No. 2, Phase I - Plan Formulation

DA, NED, CE, Waltham, Mass. 02154 12 April 1974

TO: HQDA (DAEN-CWP-E) WASH DC 20314

1. Com ments discussed below are noted with reference to subparagraphs of the 1st Indorsement.

2. Par. 1.a. - Park Street Auxiliary Conduit

The Park Street auxiliary flood control conduit is not a separable element of the Park River Local Protection Project. It is included as an integral part of the overall system to provide a flood control project complete within itself as well as to assure the engineering integrity of the flood control works and to provide the required degree of protection for a major urban area.

As stated in EM 1120-2-101, Project Formulation, paragraph 1-77b: "Because of the type of flood hazard involved, flood control projects for urban areas in general will be designed to provide protection against the standard project flood whenever that extent of protection can be provided within the limits of cost justified by the tangible and intangible benefits."

The center of the Capital City of one of the country's most urbanized states definitely is an urban area which meets this criterion. It is an area that is particularly flood prone due to its low situation and unique topography of the surrounding land. The hazard of a flood exceeding the capacity of the existing and proposed twin-box conduits and paralyzing the center of an SMSA of 664,000 people, especially its transportation systems, is clearly evident and should not be tolerated. Until the city center and surrounding lands are secure from flooding, plans for future improvements and growth will be restricted by the threat of flooding and this threat will increase as development in the outlying areas increases the runoff to the Park River. Construction of the twin-box conduit extensions without the auxiliary conduit would present a false sense of security to an area still susceptible to larger floods.

The high degree of protection and dependability provided by completing the recommended twin-box conduit extensions and the auxiliary conduit is considered the most practical and integrated solution for the flood problem in Hartford. In comparison with alternatives investigated,

DAEN-CWP-E
SUBJECT: Park River Local Protection, Connecticut River Basin, Hartford, Connecticut, Design Memorandum No. 2., Phase I - Plan Formulation

2. Revised pages for the subject report should be provided OCE where necessary.

3. Comments of the Board of Engineers for River and Harbors is inclosed for information.

FOR THE CHIEF OF ENGINEERS:

Frederick F. Irving

1 Incl
As stated

FREDERICK F. IRVING
Colonel, Corps of Engineers
Assistant Director of Civil Works
for Atlantic Divisions

DAEN-CWP-E (30 Mar 73) 1st Ind
SUBJECT: Park River Local Protection, Connecticut River Basin, Hartford, Connecticut, Design Memorandum No. 2, Phase I - Plan Formulation

DA, Office of the Chief of Engineers, Washington, D. C. 20314 16 Jul 1973

TO: Division Engineer, New England

1. The subject report is approved subject to the following comments:

a. Each separable element of the flood control plan must be independently justified unless it can be demonstrated that the elements are not separable and act as a system to assure the engineering integrity of the works and to provide the required degree of protection. This applies to the Park Street auxiliary conduit and the Farmington Bridge conduit extension. Revised pages are requested demonstrating incremental justification or supporting the need for these items as an integral part of the project.

b. The economics of the proposed Riverside pumping station should be verified. Reference paragraph 3 of DAEN-CWE-B, 1st Indorsement dated 12 April 1973 to NEDED-W, 16 February 1973, Park River, Connecticut, DM No. 1 Hydrology.

c. Benefits claimed for the parking facilities should be net benefits. The alternatives to proposed parking should be ascertained.

d. On pages B-8 and B-9, $60,000 for removal and replacement of utilities; $900,000 for removal and replacement of waterlines, sewer lines, drainage facilities and utilities; and $60,000 for replacement of highway pavement and sidewalks are shown as Federal costs. Normally these are considered to be non-Federal costs. What are the reasons for this apparent departure from standard practice?

e. A reimbursement agreement under Section 215 of PL 90-483 was signed with the Greater Hartford Flood Commission on 1 July 1969 to reimburse the City for work done that is an integral part of the Federal project. A pilot channel completed by the Commission at a cost of $128,300 is not eligible for reimbursement because it was done prior to the formal agreement. One of the conditions of the agreement states that work shall be undertaken and completed within 3 years of date signed. Therefore, no reimbursement will be made under this agreement since no work has been accomplished or started.

f. The $75,000 item for underpinning and protection of buildings appears to be low. Considering the shallow cover over the tunnel, settlement monitoring of the existing structures should be provided and the estimate should be increased to provide for the costs of corrective measures.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDED-R

30 March 1973

SUBJECT: Park River Local Protection, Connecticut River Basin, Hartford, Connecticut, Design Memorandum No. 2, Phase I - Plan Formulation

HQDA (DAEN-CWP-E)
WASH DC 20314

1. In accordance with ER 1110-2-1150, there is submitted for review and approval Design Memorandum No. 2, Phase I - Plan Formulation, for the Park River Local Protection, Connecticut River Basin, Hartford, Connecticut.

2. This memorandum reflects modifications and changes developed during the reassessment of the authorized Park River Local Protection Project. A description of departures and the reason for changes are outlined in the text of the report.

3. Advance copies of the Phase I - Plan Formulation report including the Environmental Statement dated 16 July 1971 have been reviewed by the U. S. Environmental Protection Agency. Their letter of comment dated 14 March 1973 is included in Appendix A as Exhibit 1.

4. A copy of the Final Environmental Impact Statement dated 16 July 1971 filed with the President's Council on Environmental Quality on 1 September 1971, is included as an attachment to the report. Section K of this memorandum presents environmental data available during preparation of this report.

5. Section Q of this memorandum presents the Statement of Findings prepared in accordance with EC 1105-2-501 dated 17 April 1972.

6. It is recommended that the project plan providing local flood protection for the city of Hartford be approved as the basis for preparation

NEDED-R 30 March 1973

SUBJECT: Park River Local Protection, Connecticut River Basin, Hartford, Connecticut, Design Memorandum No. 2, Phase I - Plan Formulation

of the Phase II - General Design Memorandum. It is further recommended that the departures from the project document of extending the conduit and headwall north of Farmington Avenue on the North Branch Park River and of completing the Armory Pumping Station be approved.

FOR THE DIVISION ENGINEER:

Incl(20 cys)
as

JOHN WM. LESLIE
Chief, Engineering Division

WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION
CONNECTICUT RIVER BASIN
HARTFORD, CONNECTICUT

DESIGN MEMORANDA INDEX

Number	Title	Anticipated Submission Date	Date Submitted	Date Approved
1	Hydrology		16 Feb 73	
2	GDM - Phase I - Plan Formulation		30 Mar 73	
2	GDM - Phase II - Project Design, Site Geology & Interior Drainage			
	Part I - Box Conduit	Mar 74		
	Part II - Auxiliary Conduit	Apr 75		
3	Hydraulic Analysis	Jun 74		
4	Concrete Materials	Apr 74		
5	Embankment & Foundations			
	Part I - Box Conduit	Jun 74		
	Part II - Auxiliary Conduit	Aug 75		
6	Pumping Station	Sep 74		
7	Detailed Design of Structures	Sep 74		

WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION

CONNECTICUT RIVER BASIN

HARTFORD, CONNECTICUT

DESIGN MEMORANDUM NO. 2

PHASE I
PLAN FORMULATION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

MARCH 1973

WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION
CONNECTICUT RIVER BASIN
HARTFORD, CONNECTICUT

DESIGN MEMORANDUM NO. 2
PHASE I - PLAN FORMULATION

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ATTACHMENT

Environmental Statement

WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION
CONNECTICUT RIVER BASIN
HARTFORD, CONNECTICUT

A. PERTINENT DATA

PURPOSE	Flood Control

LOCATION

State	Connecticut
County	Hartford
City	Hartford
River	Park River & North and South Branch Park River
River Basin	Connecticut

PARK RIVER DRAINAGE AREAS

Park River at the Mouth	78.7 Square Miles
North Branch Park River	27.7 Square Miles
South Branch Park River	47.0 Square Miles

RECORD OF MAJOR FLOODS

Year	Month	Peak Discharge, c.f.s.*
1936	March	5,400
1938	January	5,650
1938	September	5,320
1955	August	14,000
1955	October	6,420

*Gage at Riverside St. on Park River about 600 feet below junction of North and South Branches.

AREAS

Subject to flooding, Acres	3,000
Inundated 1955 flood of record, Acres	2,300
Properties protected	Industrial, commercial, residential and public

TWIN-RECTANGULAR BOX CONDUIT

Material		Reinforced Concrete	
		Half Section	
Conduit Sections	Length in Feet	Width	Height
Existing (12,743 ft):			
Original (1944)	5,600	30'-0"	19'-4"
Section 1	1,213	34'-0"	26'-6"
Section 3	1,710	34'-0"	26'-6"
Section 6	1,460	36'-0"	27'-6"
Section 8	2,760	22'-0"	25'-0"
Proposed (4,651 ft):			
Section 2	1,232	34'-0"	26'-6"
Section 4	1,337	34'-0"	26'-6"
Section 5	103	36'-0"	27'-6"
Section 7	1,044	22'-0"	25'-0"
Section 9	935	22'-0"	25'-0"

AUXILIARY CONDUIT

Length, feet	9,100
Size, Inside Dia.	22'-0"
Material	Reinforced Concrete

CONDUIT CAPACITIES

North Branch (Sections 7, 8, & 9)	
Normal Flow Control	10,000 CFS
System Capacity Portion	7,200 CFS
South Branch (Sections 5 & 6)	
Normal Flow Control	22,000 CFS
System Capacity Portion	16,600 CFS
Park River (Sections 1, 2, 3 & 4, plus original 5,600 ft. length)	18,000 CFS
Auxiliary Conduit (22 ft. dia.)	5,800 CFS

SYSTEM DESIGN CAPACITY (Conn. River Stage of 30 ft. MSL)

Park River Conduit	18,000 CFS
Auxiliary Conduit	5,800 CFS
Total	23,800 CFS

HEADWALLS

South Branch (Existing):	
Elevation	54.5 MSL
Freeboard	2.5 ft
Ponding Level	52.0 MSL
Material	Reinforced Concrete
North Branch:	
Elevation	54.5 MSL
Freeboard	2.5 ft
Ponding level	52.0 MSL
Material	Reinforced Concrete & Earth Dike

RIVERSIDE PUMPING STATION

Location	Riverside Street by Conduit Section 4
Capacity, cfs	180
Area Controlled, Acres	171
Runoff Controlled, inches per hr	1

ARMORY PUMPING STATION

Location	State Armory by Conduit Section 1
Capacity, cfs	170
Constructed by Others:	
Substructure, Approx. Size	70' x 90'
Sluice Gates, each	4
Flap Gate, each	1
Discharge Conduit	7' wide x 7' high
Gravity Conduit	8' wide x 7' high
Sluice Gates, each	2
Pumps, each	3
Superstructure, Approx. Size (L-shape)	50' x 57'-6"

LANDS AND DAMAGES

Lands Previously Acquired in Fee	9.5 acres
Permanent Easement	12 "
Temporary Easement	24 "
Building	Two level brick garage

PRINCIPAL QUANTITIES

Excavation, General	286,000 c. y.
Excavation, Rock	215,800 c. y.
Embankment and Fill	368,000 c. y.
Stone Protection	9,000 c. y.
Concrete	171,000 c. y.
Driving Piles	100,000 l. f.
Steel Sheet Piling	100,000 s. f.
Tunnel Support Steel	6,000,000 lbs.
Rock Bolts	25,000 l. f.
Steel Lagging	40,000 l. f.
Liner Plate-tunnel in earth	1,100,000 lbs.
Drainage Facilities	1 job
Seeded Topsoil	20,000 s. y.
Pumping Stations (2)	1 job

ESTIMATED PROJECT COSTS (1973 Price Level)

Lands and Damages	$ 1,100,000
Relocations	500,000
Pumping Stations	1,400,000
Conduit Extension	17,500,000
Auxiliary Conduit	25,300,000
Engineering and Design	3,900,000
Supervision and Administration	3,300,000
Total First Cost	$ 53,000,000

COST APPORTIONMENT

Federal	$ 51,400,000
Non-Federal	1,600,000

ECONOMIC ANALYSIS

Annual Benefits	$ 2,948,000
Annual Costs	1,973,000
Benefit-Cost Ratio	1.5 to 1

CONSTRUCTION PERIOD 3 Years

B. INTRODUCTION

1. PURPOSE. - The purpose of this memorandum is to furnish and present an objective reassessment of the authorized Park River Local Protection Project and to either reaffirm the project as authorized, or to reformulate the project plan or parts thereof as required to meet changed conditions. This document further refines and builds on the basic planning decisions accomplished during the authorization process and serves as a basis for additional planning and construction of the authorized project.

2. SCOPE. - This memorandum covers the entire project including general data on the components, functions, costs and benefits of the local protection works, as well as deviations from the authorized plan dictated by changed conditions and criteria since project authorization. The data contained herein will be supplemented and expanded by the Phase II-Project Design, General Design Memorandum and by subsequent feature design memoranda as required.

C. PROJECT AUTHORIZATION

3. AUTHORIZATION. - The Park River Local Protection Project was authorized by the Flood Control Act of 1968, Public Law 90-483, dated August 13, 1968, which reads in part as follows:

> "The project for flood protection on Park River, Connecticut is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 43, Ninetieth Congress, at an estimated cost of $30,300,000."

4. ASSURANCES. - The Park River Local Protection Project in Hartford, Connecticut, comprises conduit construction and provision of pumping and drainage facilities to supplement the existing Park River conduit for flood control. Construction of the authorized project was recommended provided that, prior to construction, local interests give

assurances satisfactory to the Secretary of the Army that they will:

a. Provide, without cost to the United States, all lands, easements, and rights-of-way required for construction and operation of the works, including lands for pumping stations and spoil disposal areas;

b. Hold and save the United States free from damages due to the construction works;

c. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army;

d. Upon completion of the conduit construction, replace pavements, sidewalks, drainage and other appurtenances, including those at Broad Street, Flower Street and Laurel Street, and bear the cost of removal, replacement, and modification to sewers, drains, utilities, or highways beyond the area required for excavation and construction of the projects;

e. Prevent changes in the headpool ponding areas which would decrease the effectiveness of the improvements and if ponding areas and capacities are impaired, promptly substitute equivalent storage capacity; and

f. Undertake all practical measures to prevent pollution from entering the Park River conduit system.

D. EXISTING FLOOD CONTROL PROJECTS

5. CORPS OF ENGINEERS

a. Connecticut River Basin. - The comprehensive plans for flood control and other purposes for the Connecticut River Basin presently consist of 27 reservoirs and 13 local protection projects. Sixteen reservoirs and 12 local protection projects are completed and in operation. In addition, seven local protection projects have been completed under the small projects special continuing authorities. Flood control reservoirs reduce flood flows from Connecticut River tributaries and with the series of dikes, floodwalls and channel improvements, principally along the main stream, protect many highly developed areas in the basin.

One of the local protection projects authorized by the Flood Control Act of 1938 and described in House Document No. 455, 75th Congress, 2nd Session, is at Hartford, Connecticut on the west bank of the Connecticut River, 52 miles above the mouth. The authorized Park River Local Protection Project is an extension of the completed section of the Park River conduit constructed as part of the Hartford Local Protection Project.

b. Hartford Local Protection. - The completed Hartford Local Protection Project, providing protection for 2,800 acres of urban area, consists of 35,000 feet of earth dikes, 4,400 feet of concrete floodwalls, six stoplog structures, five pumping stations, three pressure conduits, and appurtenant drainage facilities. The principal features of the project are shown on Plates 2-1 and 2-2.

The dikes and floodwalls extend from high ground near the Hartford-Windsor town line south to high ground just below the Hartford-Wethersfield boundary line. Along this perimeter there are six stoplog structures which are closed when floodwaters threaten to spill into the protected area. During flood stages, storm and sanitary sewage is evacuated from the protected area by the five pumping stations, two of which have been built by the city of Hartford. The three pressure conduits which discharge interior drainage and prevent backwater flooding from the Connecticut River are:

(1) Park River Conduit. - Improvement for the completed section of the Park River consists of a twin-rectangular reinforced concrete conduit enclosing the lower 5,600 feet of Park River to protect the low level built-up area of the city from Connecticut River backwater and from floods caused by runoff from the Park River Basin. Each section of conduit measures 30 feet wide and 19 feet-4 inches high with a flatly curved crown and invert. The conduit was designed to discharge 18,000 cfs with the Connecticut River stage at 26.0 feet above mean sea level and the headpool at elevation 44.0 feet mean sea level.

The function of the Park River conduit is to discharge all flows, up to design flood level, from the Park River Basin to the Connecticut River without damage to the area protected by the Hartford Dike along the west bank of the Connecticut River. It has proven effective in all storms since completion in 1944.

(2) Gully Brook Conduit. - The Flood Control Act of 1942 (Public Law 759) modified the Hartford local protection works by including construction of the Gully Brook Conduit for flood control as described in House Document No. 804, 77th Congress, 2nd Session.

Improvements consist of 3,100 feet of a rectangular section pressure conduit enclosing a portion of Gully Brook from Kenney Park through the downtown district and across Bushnell Park to empty the brook into the Park River conduit about 600 feet below its inlet. The project prevents backwater flooding from the Connecticut River and evacuates interior drainage from the 2.3 square mile drainage area of Gully Brook.

(3) Folly Brook Conduit. - The project for flood control at Hartford was further amended by the Flood Control Act of 1950 (Public Law 516, 81st Congress, 2nd Session) authorizing construction of the Folly Brook Dike and Conduit in accordance with plans on file in the Office, Chief of Engineers. Improvements consist of 2,200 feet of a rectangular, reinforced concrete box conduit, 650 feet of rolled earth fill dike and modifications to an existing stoplog structure. The Folly Brook dike and conduit provide protection for approximately 120 acres of the Folly Brook drainage area in Hartford against flooding from over-bank flow of the brook and backwater from the Connecticut River.

Construction of the Hartford Local Protection Project, including the Park River and Gully Brook conduits, was initiated in 1938 and substantially completed in 1944. Work on the Folly Brook conduit and dike was started in 1956 and construction was completed in 1957.

The Federal cost of the completed improvement was $6,929,100, including $835,000 in Public Works Administration funds. Local cost was $3,930,700, including $1,149,600 for lands and damages and $2,781,100 for special features, such as increased grades for dikes and walls, increased top width of dikes, a conduit for Park River in lieu of a walled open channel and special architectural treatment for the Bushnell Park pumping station. The completed project is now operated and maintained by the city of Hartford.

Since completion, the existing works have prevented over $53 million in damages. In a recurrence of the 1936 flood stages, the project would prevent over $52 million in damages in the 2,800-acre highly developed urban area of Hartford.

6. DEPARTMENT OF AGRICULTURE

Following the August 1955 flood, the Soil Conservation Service of the U. S. Department of Agriculture in cooperation with the Commissioner of Agriculture of the State of Connecticut developed plans for flood control works in the watersheds of the North Branch Park River and the South Branch Park River. These plans were prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566, as amended, and provide for the construction of four floodwater-retarding structures on each, the North and South Branches, 9.2 miles of channel improvement along the South Branch Park River and tributaries as well as the acquisition of land in Deadwood Swamp in the South Branch watershed for the natural storage of flood runoff. The principal features of the plan are shown on Plate 2-1.

Construction of the eight floodwater-retarding structures has been completed. Cost of improvements in the North Branch, namely the Blue Hills, Wintonbury, Bloomfield and Cold Springs Reservoirs, total about $5,000,000. These structures provide for 4,400 acre-feet of detention storage from a total drainage area of 8.1 square miles. Those in the South Branch, namely, the Talcott, Bugbee, South, and Burnt Hill Reservoirs, cost a total of approximately $2,000,000 and provide detention storage for 2,470 acre-feet from a total drainage area of 5.2 square miles.

Flood control works along the South Branch Park River and tributaries consisting of dikes, flood walls, pumping stations, relocations and realignments is estimated to cost $12,000,000. Improvements along the South Branch Park River from Hamilton Street upstream to the mouth of Trout Brook, a distance of about 12,760 feet, and extending upstream along Trout Brook for about 2,925 feet, are currently under construction. Most of the work along the South Branch Park River is complete except for the upper section and along Trout Brook which is scheduled for completion in 1973. Improvements along the lower 3,000 feet of Rockledge Brook, a tributary of Trout Brook, have been completed. Construction of channel improvements has started on the lower 3,100 feet of Piper Brook, a tributary of the South Branch Park River. Total flood control works under construction or completed amount to approximately 4.1 miles.

The remainder of the proposed work consisting of about 5.1 miles of channel improvement along Trout Brook, Piper Brook and Mill Brook has not been scheduled for construction at this time. Flowage rights to the land in Deadwood Swamp have been acquired at a cost of $64,000.

7. NON-FEDERAL AGENCIES

a. General. The Greater Hartford Flood Commission, established by the Connecticut Legislature in 1955, is authorized to provide for, construct, or arrange for the construction of flood control measures in the Park River Basin in the name of and on behalf of the City of Hartford. It became apparent to the Commission early in 1959 during the initial design of Interstate Route 84, that it would be desirable to construct the highway so as to permit later consideration of flood control measures. The highway alignment, crossing the City of Hartford, utilizes wherever possible the airspace above the Park River. It was decided, therefore, to coordinate with the State Highway Department and design and construct the highway crossings so that they might later be converted to pressure conduits.

b. Park River Conduit Extension. Four sections of the conduit extension (Sections 1, 3, 6 and 8, shown on Plate 2-2) were constructed by the State Highway Department in cooperation with the Greater Hartford Flood Commission and the City of Hartford. The four sections of conduit completed have a total length of 7,143 feet and cost approximately $19,000,000, including appurtenant works.

In addition to these four sections, the Flood Commission and the State Highway Department jointly installed part of the drainage system and the substructure including four sluice gates for the Armory Pumping Station. The remainder of the work to complete the pumping station consisting of the superstructure, pumps and equipment is included with the construction of the current local protection project.

Sections 1 and 3 on the Park River are designed for a peak flow of 18,000 c. f. s. Section 6 on the South Branch and Section 8 on the North Branch have unrestricted normal flow capacities of 22,000 c. f. s. and 10,000 c. f. s., respectively. For these sections of conduit to be effective in flood damage prevention, construction of conduit in the "gaps" and an auxiliary conduit will be required. In addition to the four sections of conduit, the Highway Department has built 1,451 feet of paved channel upstream of the headwall entrance to conduit Section 6 on the South Branch Park River.

c. Cemetery Brook Conduit. - Cemetery Brook, about 1.75 miles long, flows in a northerly direction from the Hartford-Wethersfield town line to the South Branch Park River near Brookfield Street. In order to prevent local overbank flooding, the Greater Hartford Flood Commission has enclosed about 7,200 feet in a reinforced con-

crete conduit, and has improved 400 feet of channel.

d. Trout Brook Channel Improvement. - The State Highway Department, in conjunction with the construction of Interstate Route 84, has improved 3,700 feet of channel on Trout Brook and 500 feet on Rockledge Brook in West Hartford. This work, providing a more efficient waterway and eliminating channel restrictions, has been completed in a manner similar to the plans of the Soil Conservation Service.

E. AUTHORIZED PLAN

8. DESCRIPTION

The plan of flood protection as authorized and shown on Plate 2-2 consisted of constructing extension sections 2, 4, 5 and 7, a junction structure, a headwall, an auxiliary conduit and a pumping station. The four sections of conduit extension work would join units previously constructed and would consist of twin rectangular reinforced concrete conduit enclosing a total of 3,716 feet of the Park River.

The junction structure would be constructed of reinforced concrete and would serve to combine the flows from the North and South Branches for distribution to the Park River conduit and the auxiliary conduit. A reinforced concrete headwall with a top elevation at 54.5 feet, m.s.l. would be constructed at the entrance to the North Branch conduit extension (section 8) near Farmington Avenue. The auxiliary conduit would be a 22-foot inside diameter, circular cross section concrete-lined tunnel extending from the junction structure to the Connecticut River by way of Park Street, Wyllys Street and Charter Oak Avenue, a total length of 9,100 feet. The lower end of the tunnel would pass under Highway I-91 and the existing floodwall at the Connecticut River.

The Riverside pumping station would be located on the right bank of the Park River adjacent to the proposed conduit section 4 to pump low-level drainage into the conduit in times of flood. Runoff would be conducted to the pumping station by pipes paralleling both the segments of conduit extension already built and also the proposed conduit extension sections.

9. LANDS AND DAMAGES

The sections of conduit required to complete the conduit extensions would primarily fall within the banks of the Park River and the North Branch of the Park River. The auxiliary conduit would be constructed principally within street rights-of-way. Where the conduit passes under private property, permanent easements would be secured.

The plan as authorized included about 2.5 acres of land to be acquired in fee, permanent easements to be taken on about four acres, and temporary easements for construction on two acres. One commercial and one industrial building and two residences were to be acquired.

10. RELOCATIONS

Construction of the sections of conduit extension required the removal of Broad Street, Flower Street, and Laurel Street Bridges. The street pavement, sidewalks, drains and other appurtenances would be relocated in the same general locations with grades adjusted to meet the changed conditions. In a number of locations, relocation or modifications to existing facilities outside the construction area were to be made.

F. CURRENT NEEDS AND DEVELOPMENT OBJECTIVES

11. FLOOD CONTROL

a. Current Needs. - The communities in the Park River Basin are susceptible to destructive flooding from heavy rainfall or a combination of heavy rainfall and melting snow. In general, floods in the Park River Basin have occurred coincidentally with Connecticut River flooding, although basin flooding has been experienced independent of the conditions on the main river.

To accommodate the expanding population and economy of the basin, considerable residential, commercial, and industrial development has taken place, producing greater areas of impervious surface and encroachments on the flood plains. The damaging and disruptive flooding of roads, bridges, railroads, buildings and utilities has affected every community in the basin.

In the record flood of August 1955, the Park River conduit operated as designed and effectively discharged all flood flows to reach it. However, serious flooding was experienced upstream of the conduit entrance in the City of Hartford due to insufficient channel capacity. Some degree of this upstream flooding was anticipated when the Park River conduit was constructed in 1944, but since the conduit's principal function was to transmit flows to the Connecticut River and to prevent damage in the lower part of the city, the infrequent occurrence of upstream flooding was, under conditions then in existence, not considered to be serious. Since 1944, the property values in the basin upstream of the conduit have increased and growth and development has taken place. As a result, the problem of flooding and damage in this area is now a serious one.

The Department of Agriculture plans for detention reservoirs and channel improvement within the basin are designed to reduce flood damages principally in upstream areas below the reservoirs and adjacent to the improved channels where extensive housing and highway development has taken place in recent years. The channel improvements necessary to remove the high concentrations of runoff from frequent storms will increase downstream flood peaks in larger, less frequent storms. The net result of basin development and faster concentration of runoff is a substantial increase in the magnitude of the standard project flood.

The isolated sections of conduit extension constructed in Hartford and serving as substitutes for bridges for the interstate highways are not effective for flood control, nor are they constructed to be effective without extension. If the conduit extension were continuous and the 'gaps' filled in with comparable sized conduit to contain flood flows, the conduit effectiveness would be limited to the 18,000 c. f. s. design capacity of the existing Park River conduit. A standard project flood in the basin, formulated with allowance for changed future conditions in the upper watershed consisting of urban expansion,would cause an unrestricted flow of 30,300 c. f. s. at the confluence of the North and South Branches or 12,300 c. f. s. greater than the capacity of the Park River conduit. Even though the conduit extension were completed by filling in the 'gaps', further flood control improvement will be needed to prevent extensive flooding and damage in Hartford from floods approaching standard project flood magnitude.

b. Development Objectives. - The Soil Conservation Service retarding structures will reduce downstream peak flows during major storms. However, improvement of river channels in the South Branch watershed now under way, consisting of realignment, widening and deepening, will increase downstream peak flows due to general lowering of gradients, loss of valley storage, and more efficient flow conditions. The net effect of these improvements, recent highway and housing developments and projections of future growth, is to increase the standard project flood at the confluence of the North and South Branches from 25,800 c. f. s., under 1955 conditions in the basin, to 30,300 c. f. s. under current conditions.

Without further flood control improvements, a standard project flood would inundate extensive areas in Hartford upstream of the existing Park River conduit. Due to the limited capacity of the conduit to discharge Park River flows to the Connecticut River, (18,000 c. f. s.) the head dike and river banks would be overtopped. An estimated 10,000 acre-feet of water would flow overland through lower Bushnell Park and highways and inundate 1,800 acres of urban area behind the Connecticut River dike and the floodwalls.

The plan to control flooding in Hartford from a standard project flood in the Park River basin consists principally of filling in 'gaps' between the sections of conduit work accomplished for highway construction and constructing an auxiliary conduit to supplement the existing Park River conduit in discharging flows to the Connecticut River. The entire conduit system will operate under pressure during major storms, with the amount of flow through the existing Park River conduit and the auxiliary conduit being governed by the difference in elevation at the headpools and at the conduit outlets on the Connecticut River.

During the record flood of August 1955, in the Park River Basin, the Connecticut River rose to a maximum elevation of 30 feet, msl. At the time of maximum Park River flow, the stage on the Connecticut River was at elevation 26 feet, m. s. l. For project design, it was assumed that the Connecticut River would be at a stage of 30 feet, m. s. l. concurrent with the peak discharge of the standard project flood in the Park River Basin.

The conduit constructed on the South Branch includes an entrance headwall with a top elevation of 54. 5 feet, m. s. l. With a similar headwall proposed at the North Branch conduit entrance, and an allowance of 2. 5 feet of freeboard, the upper limit of temporary storage

that can be retained in the Branches is to elevation 52 feet, m. s. l. Above this elevation, widespread flooding and major damages would occur. In addition the State of Connecticut and the Greater Hartford Flood Commission have established encroachment lines and flood plain zoning predicated on elevation 52 feet, mean sea level.

In order to pass a standard project flood without exceeding 52 feet, m. s. l. on the Branches and with a Connecticut River stage of 30 feet, m. s. l., a 22-foot diameter auxiliary conduit is required to supplement the existing Park River conduit. The maximum flows through the existing Park River conduit and the auxiliary conduit under design flood conditions are 18,000 c. f. s. and 5,800 c. f. s., respectively. Flows over and above the system capacity are temporarily stored in the headwater areas of the North and South Branches.

G. ALTERNATIVES

12. CONSIDERED IMPROVEMENTS

a. General. - Following the August 1955 record flood in the Park River basin, the Greater Hartford Flood Commission and the Soil Conservation Service of the Department of Agriculture engaged consulting engineers to study the flood problem in the Park River basin and determine possible corrective measures. These studies have resulted in the recently completed projects and the current programs of construction. Alternative solutions previously considered in the pre-authorization studies were reviewed and updated during the Phase I - Plan Formulation investigations.

b. Additional Reservoirs

(1) Greater Hartford Flood Commission. - Studies accomplished for the Greater Hartford Flood Commission concerning the flood problem investigated many alternative reservoirs and reservoir systems in the headwaters as well as channel improvements throughout the basin. These were considered as supplemental to plans of downstream conduit and auxiliary conduit extension. The Commission also considered the diversion of North and South Branch flows.

One reservoir plan, considered in early studies by the Greater Hartford Flood Commission and later studied and eliminated by the Soil Conservation Service, appeared to be the most favorable of the plans not developed. It would consist of two reservoirs in the Piper Brook watershed and overflow to Wood Pond in the Trout Brook

watershed. At the time of the original study, the plan would have provided 3,300 acre-feet of storage from a drainage area of 9.7 square miles. However, the construction of an east-west interstate highway, and a proposed north-south interstate highway passes through the storage area reducing the storage to about 2,300 acre-feet. The plan, estimated to cost about $15,000,000, was considered not feasible or economically justified.

(2) Soil Conservation Service. - From studies prepared for the Soil Conservation Service (SCS), plans of improvement were developed for the North and South Branches. The eight reservoirs constructed were derived as the maximum reservoir development on the basis of studies inclusive of review of previous studies by others.

Four of the completed SCS detention reservoirs in the North Branch watershed were selected from a total of 14 sites studied. The most favorable of the remaining 10 sites investigated and eliminated was a dam and reservoir on Tumbledown Brook. The reservoir would store 1,700 acre-feet from a 3.8 square mile drainage area and would cost an estimated $5,000,000. The site was eliminated principally because of strong local opposition to land acquisition involved. It is anticipated that local objection to development of this site would be encountered in the future also. Development of other smaller sites would be less favorable and larger sites would involve thickly settled areas. A total of thirteen sites including the four completed detention reservoirs in the South Branch watershed were studied by the Soil Conservation Service. Eight of the thirteen sites were found to be not economically justified because of recent development of high value properties and the alignment of existing and proposed interstate highways and access roads in reservoir or structure areas. One site, Deadwood Swamp, was not developed due to its effectiveness under natural conditions. The maintenance and flowage rights of Deadwood Swamp in its present state have been acquired.

(3) Corps of Engineers. - The construction of flood control reservoirs in upstream tributaries of the Park River was studied as a method of providing flood protection for the lower, built-up, flood-prone areas in Hartford. A comprehensive study of topographic maps, supplemented by field reconnaissance, revealed that the desirable sites have been utilized by the Department of Agriculture for floodwater-retarding structures, and that certain of the remaining sites considered were too far removed from the industrial and urban damage centers to provide any significant reduction in flood levels or to warrant further

study. Other sites were abandoned when it was found that reservoir construction requiring acquisition of high value residential properties would be more costly and socially disruptive than alternative flood control improvements in the lower basin. Thus this approach was eliminated.

c. Modification of Existing Reservoirs. - A review by the Corps of Engineers of the eight ungated upstream detention reservoirs constructed by the Department of Agriculture was made with a view towards introducing modifications which would allow them to be utilized for floodwater retention rather than only for retardation. It was found that the cost involved in accomplishing the necessary structural modifications would exceed the anticipated downstream benefits. Thus this approach was considered impractical.

d. Diversion of the South Branch

(1) Greater Hartford Flood Commission. - In an early study consideration was given to the diversion of Piper Brook flood runoff to the Mattabesset River by way of Webster Brook. A field and office review of the plan indicated a cost of over $15,000,000. About 22,000 feet of channel improvement, rebuilding of four bridges on Webster Brook, and three on the Mattabesset River, and construction of a diversion structure and dikes and walls at several locations would be the major items of cost. During a major storm, the Mattabesset River would be at flood stage and diversion of Park River runoff would be a liability. The plan would be less effective than increasing downstream conduit capacity by construction of an auxiliary conduit in the Park River basin.

(2) Corps of Engineers. - In addition to reviewing previous studies on the diversion of flood flows from Piper Brook to the Mattabesset River by way of Webster Brook, an investigation was made of possible diversion of Piper Brook from just below its confluence with Mill Brook, in the watershed of the South Branch Park River, to Wethersfield Cove. Either plan would be more costly than providing conduit capacity in the lower basin and would add to flood flows in adjacent basins. Thus this approach, too, was considered impractical.

e. Additional Third Barrel. - Addition of a third barrel to the 5,600 foot existing Park River conduit in lieu of the proposed auxiliary conduit was investigated and found physically not feasible. Since completion of the original conduit in 1944, a major divided highway has been constructed over the lower two-thirds of the conduit from Interstate

Highway No. 91 to a point west of Main Street. The existing conduit passes under Main Street and the Hartford Public Library which occupies a half block on the east side of Main Street. High retaining walls exist east and west of Main Street. Multiple story buildings line the highway on both sides directly behind the retaining walls. In addition, a divided highway is planned for construction over the remaining upper third of the conduit in the near future.

f. Local Protection Works. - Plans to supplement the conduit work then under way by the Connecticut State Highway Department were studied during the preauthorization stage. They included those measures that would be effective in a standard project flood. Construction of walls and dikes along the river banks and a pumping station to intercept drainage was considered. Dikes and walls would rise about 30 feet above the normal water level of the river. Owing to existing urban development in most areas, space is not available for earth dikes without the taking of valuable buildings and properties. In both cases, dikes and flood walls would encroach upon valuable urban properties and create an unsightly condition affecting the social environment of the Hartford business area. Although the cost of a combination of dikes and walls was found to be about equal to the cost of conduit construction, the degree of flood protection would be much less without the hydraulic pressure effect of the box conduit and the auxiliary conduit. Construction of floodwalls and dikes along the Park River was determined not feasible or adequate to provide flood protection against the standard project flood due to the limited discharge capacity of the existing Park River conduit.

g. Channel Encroachment Lines. - The State Water Resources Commission has established channel encroachment lines from the outlet of the Soil Conservation Reservoirs downstream to Albany Avenue on the North Branch Park River. Plans for the establishment of similar lines are being considered for the South Branch. Establishment of these lines will be valuable from a long-range point of view by controlling the construction of new structures in flood-prone areas and thereby reducing future flood damages. However, this program does not relieve present development from the impact of a standard project storm.

h. Flood Proofing and Zoning Measures. - Zoning ordinances and encroachment lines have been established by Hartford and West Hartford in the headpool areas above the conduit entrances on the North and South Branches. The Greater Hartford Flood Commission or its successor must approve any structure, use, or filling within the designated flood plains before a permit for such action can be issued. The

Commission requires that the holder of the permit must provide equivalent water storage capacity before encroaching upon the headpool ponding area. Consideration was given to the possibilities of using a combination of flood proofing and zoning measures to decrease future flood damages in the downtown Hartford area now subject to inundation from a Standard Project Flood on the Park River. It was determined that such measures could not readily be achieved except through the expenditure of large sums of money and the disruption of city functions. Flood proofing existing buildings would not provide protection to the very heavy vehicular and pedestrian traffic in the downtown area, nor to the heavy vehicular traffic on the arteries leading into and through Hartford. Access to and from the city would be jeopardized.

i. Flood Warning and Evacuation. - A system to provide adequate warning to allow the temporary evacuation of people from the affected flood areas could be put into effect, but the system would be of little value. Flood warnings would inform people to leave prior to flooding conditions, but commercial and industrial establishments with their fixed equipment and large inventories would be inundated suffering excessive losses. Transportation would not be accessible and many utilities would be damaged and cease to function. The economic life of Hartford would be disrupted for many weeks. The permanent evacuation of this densely developed urban area is not practical or feasible as it would require the removal of hundreds of millions of dollars worth of improvements affecting the existence and economics of the entire metropolitan area of Hartford.

13. DISCUSSION

a. General. - Alternative flood control improvements were given consideration with major emphasis on providing upstream reservoir storage and diversion in lieu of auxiliary conduit capacity. The presence of recent housing, highway and commercial developments in the basin, as well as established communities along the main streams, makes the construction of large impoundments impractical, economically infeasible and socially unacceptable. Impoundments throughout the basin in the future will be less favorable due to continued growth and development.

b. Upstream Reservoirs. - The eight completed SCS North and South Branch detention reservoirs with a combined storage capacity of 6,870 acre-feet, would not eliminate the need for filling the conduit "gaps" or constructing an auxiliary conduit. The reservoirs in conjunction with the existing channel program will realize flood con-

trol benefits in low areas along the main stream. However, the more rapid concentration of flow combined with future development will increase flows at Hartford in a major flood. In a standard project flood, without an auxiliary conduit or upstream storage, the headpools at the North and South Branch conduit extension entrances would rise to elevations above 54. 5 feet m. s. l., or more than 2. 5 feet above the design elevation of 52. 0 feet, m. s. l. overtopping the headwalls. Provision of total storage required in upstream reservoirs, if feasible, would exceed the cost of the auxiliary conduit. Therefore, no further consideration was given to reservoir storage.

c. Stream Diversion. - Diversion of South Branch flood run off to Wethersfield Cove from the confluence of Mill and Piper Brook consisting of three miles of conduit and a diversion structure would be more costly than the proposed downstream auxiliary conduit. Diversion of North Branch flood flows to the Connecticut River either through Windsor or Hartford would require construction works through an urban area incurring excessive costs that would be greater than the proposed auxiliary conduit downstream. Therefore, diversion of flood flows was found not to merit further study.

d. Non-Structural Measures. - Future damage in both branches above Hartford will be reduced by the completed detention reservoirs and the channel improvement work now under construction. Losses will be reduced by the current program of flood plain zoning and established encroachment lines along the channels. Future losses may also be reduced by extending the program of flood plain zoning in areas not fully protected by the improvements. Flood proofing and evacuation of well established commercial and industrial establishments in the major damage areas in Hartford is not a practical solution. These areas require protection against future floods. Flood warning may be effective in moving people but would have little value in reducing losses to commercial and industrial establishments.

14. CONCLUSIONS

The most practical solution to the flood problem in Hartford consists of completing the conduit extensions and adding an auxiliary conduit to provide protection from the standard project flood. The proposed improvement provides a high degree of flood protection and in comparison with alternatives investigated, is the optimum plan affording enhancement of the environment, social well-being and economic growth in the metropolitan Hartford areas.

H. INVESTIGATIONS

15. PREVIOUS INVESTIGATIONS. - Flood control at Hartford has been considered in the following published reports:

a. "308" Report. - A report dated 28 February 1935 and printed as House Document No. 412, 74th Congress, 2nd Session, presented a comprehensive plan for combined flood control and power development of the Connecticut River and its tributaries. The report recommended an initial Flood Control Plan of ten flood control reservoirs in Vermont and New Hampshire.

b. 1937 Survey Report. - A report dated 20 March 1937 and printed as House Document No. 455, 75th Congress, 2nd Session, proposed a revised comprehensive plan for flood control of the Connecticut River and its tributaries consisting of 20 reservoirs and dikes at 7 localities, including the city of Hartford. The report recommended that the authorization for additional reservoirs be deferred and that the authorized project be modified to provide for the protection of 7 localities by dikes and related works.

c. First Interim Report. - The Board of Engineers for Rivers and Harbors, in a report printed as House Document No. 653, 76th Congress, 3rd session, approved 11 March 1940 recommended that the authorized project for protection by dikes and related works of 7 localities in Massachusetts and Connecticut be modified to provide for construction of the project at East Hartford in accordance with revised plans. The city of Hartford was one of the localities included in the authorized plan.

d. Second Interim Review Report. - A report of the Board of Engineers for Rivers and Harbors, printed as House Document No. 724, 76th Congress, 3rd Session, approved 9 May 1940, recommended modification of the approved flood control plan to include 20 reservoirs and protective works at 4 additional sites.

e. Gully Brook Report. - A report dated 20 September 1941 and printed as House Document No. 804, 77th Congress, 2nd Session, recommended that the existing flood control project at Hartford be modified to include construction of the Gully Brook conduit extending from the north bank of the Park River to a point approximately 400 ft. above Edwards Street.

f. NENYIAC Report. - Flood control for Hartford, Connecticut is covered in Part Two, Chapter XXI of The Resources of the New England-New York Region. This comprehensive report on power potentialities and on the land, water and related natural resources of the region, prepared by the New England, New York Inter-Agency Committee was submitted to the President of the United States by the Secretary of the Army on 27 April 1956. A flood control system of 26 reservoirs and 10 local protective works, including the completed Hartford local protection project, was proposed. Part I and Chapter I of Part 2 are printed as Senate Document 14, 85th Congress, 1st Session.

g. Survey Report. - The Report on Review of Survey for the Park River Basin, Connecticut was completed by the New England Division in 1966 and was subsequently printed as Senate Document No. 43, 90th Congress, 1st Session. This document served as a basis for authorization of the Park River Local Protection Project.

h. Connecticut River Comprehensive Study. - A report dated June 1970 proposed a revised comprehensive plan of improvement for the Connecticut River Basin in the interest of flood control, navigation, hydroelectric power development, water supply, and other purposes coordinated with related land resources. The completed nine-volume report was submitted by the Coordinating Committee to the New England River Basins Commission in October 1970 for coordination of review by the heads of the Federal departments and the Governors of the four basin States. The final plan includes projects and programs recommended for initiation in the next 10 to 15 years. Potential measures were also identified to meet the basin needs through the year 2020. Included in the recommendations for early implementation were the construction of five local protection projects within the basin including the Park River project essentially as authorized by the 1968 Flood Control Act, P. L. 90-483.

16. POST-AUTHORIZATION INVESTIGATIONS. - In order to reaffirm the authorized Park River Local Protection Project and/or to reformulate the scope of the flood protection plan, basic data extracted from previous studies and past reports were fully utilized. Additional studies have been made as follows:

a. Project Scope. - Basic planning decisions made in the general investigations stage have been reviewed, updated and supplemented by field surveys and conferences with local officials. Project coordination has been maintained with other governmental and state agencies as well as local interests. Environmental impacts and effects

of the flood control works, project features and cost estimates have been reviewed and updated.

b. Hydrologic Studies. - Previous investigations were reviewed, updated and supplemented with additional data developed based on current site conditions. Detailed hydrologic analyses have been made to determine stream flow, flood development, project design flood, criteria for interior drainage and pumping requirements. The methodology and results of these studies are presented in Design Memorandum No. 1, Hydrology, which has been submitted for review.

c. Damage Surveys. - Previous flood damage surveys in the Park River flood plains of Hartford were reviewed and updated to conform with current site conditions. Recent field investigations revealed extensive changes and developments have occurred in recent years. Detailed analysis of potential flood losses and damages have been made and flood prevention benefits have been revised and updated accordingly.

d. Lands and Damages. - Appraisals of lands and damages previously determined have been reviewed and updated in accordance with present site conditions and current real estate values in the project area.

e. Subsurface Explorations. - Information derived from subsurface explorations made by others and utilized in the pre-authorization investigations was reviewed. Geologic subsurface investigations were made of foundation conditions at selected locations along the Park River and the North Branch for the proposed twin-box conduit and along Park Street for the proposed auxiliary conduit. Detailed data derived was used to substantiate or modify previous information considered to determine project construction features and costs.

f. Official Meetings. - Meetings were held with the Greater Hartford Flood Commission, Connecticut State Highway Department, Metropolitan District and Officials of the City of Hartford to keep them advised of the project features and to exchange ideas as well as coordinate the proposed improvements. Information concerning non-Federal project cost have been discussed with the Greater Hartford Flood Commission.

g. Public Meeting. - A public meeting was held in Hartford, Connecticut on 17 October 1972 to exchange information concerning the authorized flood control plan and to procure the objectives and needs of interested parties as well as their preferences regarding alternative development. Information was also requested on economic, social, ecological and environmental impacts relative to the project.

Approximately thirty-five persons attended the public meeting. Seventeen spoke or participated in the discussion including state and city officials and representatives of business establishments, public utilities, civic organizations and individuals. Written statements for the record from United States Congressman William R. Cotter and Connecticut State Senator Joseph J. Fauliso presented by the Deputy Mayor of Hartford favored construction of the project. The desires and needs of the Greater Hartford Flood Commission were presented by the Commission Chairman.

Mr. Batycki, Director of Public Works, Hartford, representing the City Manager, urged immediate action on the project and submitted eleven prepared statements by various Hartford department heads representing redevelopment, health, safety and other functions of the city government, all of which expressed support for the project.

Of the seventeen speakers, sixteen spoke in favor of the flood protection improvements with major emphasis on extending the twin-box conduit upstream of Farmington Avenue and starting construction of the project as early as possible. One speaker spoke in opposition of structural flood control measures and favored land management and non-structural controls.

17. FUTURE INVESTIGATIONS. - Detailed design of the recommended project will require additional studies and investigations prior to construction. Topographic surveys of the project site will be accomplished and the boring and drilling program will be expanded to more accurately define subsurface conditions. General Design Memorandum, Phase II - Project Design will be prepared to present general data in more technical detail on the components, functions and costs of the Park River Local Protection Project. The report will serve as a basis for further detailed design studies which will be included in subsequent feature design memoranda. Construction plans and specifications will be prepared following review and approval of design memoranda.

I. PLAN FORMULATION

18. GENERAL. - The prime purpose for flood control improvement along the Park River is to reduce destructive flood damages in the densely populated and developed urban area of Hartford, Connecticut. Alternatives discussed previously in Section G of this report eliminated the practicality of reducing peak flows at Hartford through upstream reservoir storage or stream diversion to adjacent watersheds. Evacuation, flood proofing or extensive restrictive zoning of the flood plain is impracticable due to the advanced stage of development. Provision for further flood control was therefore limited to supplementing the existing Park River conduit system

in the lower basin. The sections of conduit constructed by local interests as Interstate Highway crossings have open reaches. As a result a serious flood threat remains. However, in conjunction with the existing Park River conduit, they provide a favorable basis for additional flood control improvements.

Preliminary consideration was given to construction of conduit to fill in the "gaps"between the sections of highway conduit and installation of a pumping station as the plan for flood control. In view of the rapid runoff caused by urbanization in the upstream areas, this plan alone would not be adequate to discharge a project design flood or provide the high degree of flood protection justified for a major urban area.

The project for adequate flood control in Hartford, in addition to extending the existing conduits and constructing pumping stations, includes the construction of an auxiliary conduit from the junction of the two branches of the Park River to the Connecticut River.

19. CONDUIT EXTENSIONS. - The Park River twin-barrelled conduit, each section 19'-4" high and 30'-0" wide, completed in 1944, extends 5600 feet upstream from the Connecticut River through the business section of Hartford to the westerly end of Bushnell Park. In 1968, the city of Hartford through the Greater Hartford Flood Commission working with the State of Connecticut, completed four sections of twin-rectangular concrete conduit in conjunction with the construction of Interstate Highway No. 84 (see Plate 2-2).

Section 1 of the recently constructed twin-barrel conduit, each barrel 26'-6" high and 34'-0" wide, joins the existing Park River conduit and extends 1,213 feet upstream to a point by the Connecticut State Armory building. Further upstream on the Park River, Section 3 consisting of 1,710 feet of conduit, each barrel 26'-6" high and 34'-0" wide, was constructed under I-84 and Capitol Avenue. Conduit Section 6, each barrel 27'-6" high and 36'-0" wide, is 1,460 feet in length and located in the lower end of the South Branch Park River just above the river confluence with the North Branch Park River. Conduit Section 8, each barrel 25'-0" high and 22'-0" wide, was constructed along the North Branch Park River from just below I-84 and upstream for a distance of 2,760 feet to a point about 75 feet south of Farmington Avenue.

The original Park River conduit was designed for a discharge capacity of 18,000 cfs. With a greater design storm than previously used due to additional development in the basin, the project design flood would produce a flow of 30,300 cfs at Riverside Street if the Park River had unrestricted

capacity. With existing conditions the design flood would overtop river banks and headwalls and cause serious flooding in downtown Hartford. Completion of open sections in the existing conduit system will permit pressurizing the entire conduit system thereby increasing the overall capacity.

Construction of twin rectangular concrete conduits conforming in size and shape to the existing sections is derived as the least disruptive and most feasible and economical project feature to provide flood protection along the Park River, North and South Branches and in the city of Hartford. This would provide a continuous conduit from the Connecticut River upstream to the headwall entrances on the North and South Branches.

During project formulation it became apparent that a positive need exists to extend the North Branch conduit to a point above the Farmington Avenue bridge. The Greater Hartford Flood Commission has magnified past expressions of interest in favor of this extension as indicated by their letter dated 2 June 1972 included in Appendix A, Exhibit 4. Also, during the public meeting of 17 October 1972, several officials of the city of Hartford expressed major emphasis on extending the twin-box conduit upstream of Farmington Avenue. The headwall and concrete wing walls along the south side of the roadway would create detrimental economic, social and environmental effects on the developed urban area of Farmington Avenue. Without doubt the authorized location would not receive total local acceptance.

The proposed construction of conduit Section 9 from the north end of Section 8 and extending north of Farmington Avenue would prevent flooding and damages along this reach of the river and on Farmington Avenue, one of the city's main and busiest east-west traffic arteries. The elevation of the existing roadway on the Farmington Avenue Bridge is 50 feet, mean sea level. During a project design flood this major artery would be flooded to a depth of two feet.

The present Farmington Avenue bridge has a limited waterway opening consisting of twin-arches; each arch is 24 feet wide at the base by 16 feet high with a cross-sectional area of 322 square feet. During the 1955 record flood the Albany Street gage upstream of Farmington Avenue recorded flows of 10,000 cubic feet per second (cfs). The Farmington Avenue bridge acted partly as a dam during the high flows and the roadway was overtopped and floodwaters continued overland downstream. Losses and damages were incurred by properties along the river and on the north and south sides of Farmington Avenue. Under

present conditions due to the inadequacy of the bridge opening, overtopping of the roadway would start with a North Branch flow of about 5,900 cfs (Elev. 50 feet, m. s. l.); 4,100 cfs less than the 1955 record flood. Minor damages upstream from backwater flooding starts at about elevation 46 feet, mean sea level.

With construction of the authorized headwall, the tailwater elevation downstream of the Farmington Avenue bridge would be reduced, thereby increasing the non-overtopping hydraulic capacity of the bridge. However, there would still be a significant head loss through the existing bridge (4 feet ±) with a North Branch design flow of 9,400 cubic feet per second. Floodwaters could possibly exceed the depth of two feet (Elevation 52) over the roadway and cause additional damages and losses in the area.

During major floods with the headwall located on the south side of Farmington Avenue and the roadway overtopped, properties on the north side would be flooded and damaged causing possible injurious displacement of people and disruption of traffic and transportation on the major artery as well as obstructions to access in the area. In the event of such a condition, the views of local residents and public opinion may be critical of the Corps of Engineers by alleging the wall retards flows, whereas without the wall, floodwaters would flow overland downstream and spread over a larger flood plain area south of Farmington Avenue.

The headwall situated at the north end of conduit Section 8 would be located on State property which may be required for construction of a connector from Farmington Avenue to Interstate Highway 84 to relieve local traffic congestion. The exit and entrance ramp stubs for this connector have previously been constructed in conjunction with the new highway system. The headwall at the authorized location would interfere with the construction of such a connector.

Direct economic losses would also result from a decrease in property values and taxable income to the city of Hartford. Presently, community growth is inhibited along the North Branch above Farmington Avenue. Woodland Street, which parallels the east side of the river, has developed into an area of high-rise luxury apartments and professional buildings. The west side of Woodland Street slopes down to the river and an appreciable amount of land is in the flood plain zone. Since the zoning ordinance prohibits filling or building within the flood plains, further construction and expansion is restricted also creating a tax loss to the city of Hartford.

At the authorized location concrete wing walls extending east and west about 350 feet in each direction would be required along the south side of Farmington Avenue to tie the headwall into high ground at elevation 54.5 feet, mean sea level. The wing walls would be situated in front of apartment houses, driveways, entrance walkways and other access ways to private and public properties. Several openings with stoplog structures or flood gates would be necessary to provide access through the wall for pedestrians and motor vehicles. The concrete wall would be about 4.5 feet above the roadway impairing the view from the lower floors of the apartment houses with adverse social impact. Also, the wall alignment would encroach upon small front yard lawns and shrubs causing detrimental effects on the aesthetic values to the buildings as well as the area.

Construction of conduit Section 9 would consist of about 935 feet of twin-rectangular concrete conduit and a concrete headwall and earth dike as shown on Plate 2-2 and 2-5. Studies of terminating the conduit and locating the headwall about 150 feet upstream of Farmington Avenue concluded that it was neither feasible nor practical to meet high ground at elevation 54.5 feet, mean sea level. On the east side the headwall would tie into an existing building or would be constructed about 150 feet along the north wall of the structure. On the west side an earth dike and a concrete flood wall would be constructed between buildings and would have to be extended about 500 feet to Lorraine Street. This type of improvement would interfere with access to the back side of buildings and parking areas, obstruct driveways, and require the taking of valuable lands presently utilized as side and back yards as well as for parking.

The length of 935 feet was selected as the shortest distance and most economical location north of Farmington Avenue for the headwall and dike to meet high ground. Finished grades over the conduit will blend in with the adjacent area and present use will continue, such as for driveways and parking areas. The dike and headwall will be located in an environment where space is not restricted by buildings, and where finished grades will meet the natural land contours. The area will be landscaped to be aesthetically pleasing to the public. Part of the river channel upstream of the headwall will be realigned for training flows to the inlet.

The Section 9 extension is estimated to cost $4,900,000 including non-Federal costs of $580,000 for lands and damages and relocations. About 2.5 acres of land and a deteriorated two-story brick garage will be required for construction of Section 9. The relocation of a 54-inch main interceptor sewer line and sections of a 51-inch and 27-inch sewer line will be necessary because of the twin-box conduit alignment. Local

interests are aware of the added non-Federal cost for conduit Section 9 and have continued to emphasize the need for the conduit extension.

Because of the relatively limited amount of land between the apartments and professional buildings along Woodland Street and the North Branch Park River, parking areas are situated on sloping or low-lying land. After construction of conduit Section 9, the area will be re-graded to provide less abrupt but still natural looking contours. The appropriate areas will be paved, seeded or planted as required to retain the present open space characteristics. The environmental values would also increase by extending the conduit above Farmington Avenue. Most of the increase would result from eliminating the concrete wall from Farmington Avenue and improving conditions along the North Branch. Erosion exists along the river banks undermining adjacent properties, a garage and parking areas. Illegal waste and rubbish disposal is evident in the stream and along the banks for a short distance above Farmington Avenue. The construction of conduit Section 9 will eliminate these problems.

In light of the above economic, social and environmental disruptive effects of tying in a headwall in the originally authorized location, the Section 9 extension was not considered incrementally. From an economic objective it is viewed as an essential non-separable element in assuring the project's functional integrity. An incremental economic analysis may not support the extension due to the fact that the serious consequences of flooding would only be realized in the rarer less frequent storms. However, the concept applied to the total project is to provide a high degree of flood protection to this highly urbanized and heavily populated area with minimum social and environmental effects. Failure to extend the conduit would make an otherwise sound project vulnerable to future losses and expose the Corps to critical review.

20. AUXILIARY CONDUIT. - Construction of the conduit extensions with a maximum capacity of 18,000 c.f.s. would not provide project design flood protection for the city of Hartford. The inlets and headwalls of the conduit on the North and South Branches would be overtopped resulting in the release of about 10,000 acre-feet of water in the downtown section of Hartford. If it were capable to impound floodflows in excess of 18,000 c.f.s. upstream of the conduit entrance, then ponding would occur to about elevation 57 feet, mean sea level.

Alternatives investigated to provide project design flood protection were not economically feasible or justified. Construction of the auxiliary conduit to convey excess floodflows to the Connecticut River is derived as the most feasible and economical plan. Of prime importance in

determining the size of the auxiliary conduit is the coincident tailwater elevation upstream of the headwalls on the North and South Branches.

Initial studies indicated that due to physical limitations it would not be possible to construct an auxiliary conduit large enough to carry the project design flood by gravity flow. In order to determine an adequate and economical size for the auxiliary conduit, an analysis was made of surcharging the conduit system and modifying the peak inflow by the valley storage in the North and South Branches. The existing South Branch headwall and conduit were structurally designed for 10 feet of surcharge which is equivalent to elevation 54.5 feet, mean sea level, at the conduit entrance. A minimum freeboard of 2.5 feet would result in a maximum ponding elevation of 52 feet, mean sea level. To be compatible with conditions on the South Branch, the headwall at the North Branch conduit entrance would be at the same elevation.

Plans involving alternative sizes of auxiliary conduit were made to determine the effect of varying diameters relative to the reduction of flood damages and ponding elevations at the headwalls. Studies considering estimated costs, benefits and excess benefits for 20, 22, 24, 26 and 30-foot tunnel diameters are shown in Table 1. The increase in size of the auxiliary conduit would lower the maximum elevation and storage in the headpools.

Auxiliary conduit sizes less than 20 feet in diameter were examined but considered not feasible to use as alternatives. The increase in static head and surcharge pressure would require extensive modifications and in some cases reconstruction of the existing rectangular twin-barrelled conduit to provide a structurally stable conduit. Total project cost would increase almost 50% ($25,000,000) over the current project cost utilizing an auxiliary conduit less than 20 feet in diameter. An alternative plan of this concept or magnitude is not practical or justified. No excess benefits would be derived.

Conduit sizes 20 to 22 feet in diameter would increase the headpool elevation above 52 feet, msl and project costs would increase considerably to include reconstruction of the South Branch headwall, construction of the North Branch headwall and dike at a higher elevation, reinforce the stability of existing conduit sections, construction of the proposed conduit extensions relative to the added surcharge pressure and construction of street gates and dikes in the headpool areas to provide effective flood control for the overall project. In addition, lands and damages and relocations would be required in the headpool areas.

TABLE 1

AUXILIARY CONDUIT ALTERNATIVE SIZES
SUMMARY OF COSTS AND BENEFITS
(In Thousands)

	DIAMETER OF AUXILIARY CONDUIT				
	20 FT.	22 FT.	24 FT.	26 FT.	30 FT.
Max. Headpool Elev. (Ft. m. s. l.)	53.0	51.8	50.3	49.4	48.0
Federal:					
First Cost	50,900 (1)	51,400	54,700	58,400	65,300
Int. During Const.	2,481	2,500	2,666	2,847	3,183
Total Investment	53,381	53,900	57,366	61,247	68,483
Non-Federal:					
First Cost (2)	2,000	1,600	1,600	1,600	1,600
Int. During Const.	98	78	78	78	78
Total Investment	2,098	1,678	1,678	1,678	1,678
Annual Charges:					
Federal:					
Int. & Amortization	1,809	1,826	1,943	2,075	2,320
Non-Federal:					
Int. & Amortization	71	57	57	57	57
Major Repl.	40	40	40	40	40
Maint. & Oper.	50	50	50	50	50
Total Non-Federal:	161	147	147	147	147
TOTAL ANNUAL COST	1,970	1,973	2,090	2,222	2,467
TOTAL ANNUAL BENEFITS	2,918	2,948	2,983	3,013	3,065
EXCESS BENEFITS	948	975	893	791	598
B/C RATIO	1.48	1.49	1.43	1.36	1.24

(1) Includes the increase in costs for modifications to existing flood control works and for additional street gates and dikes required in the headpool areas.

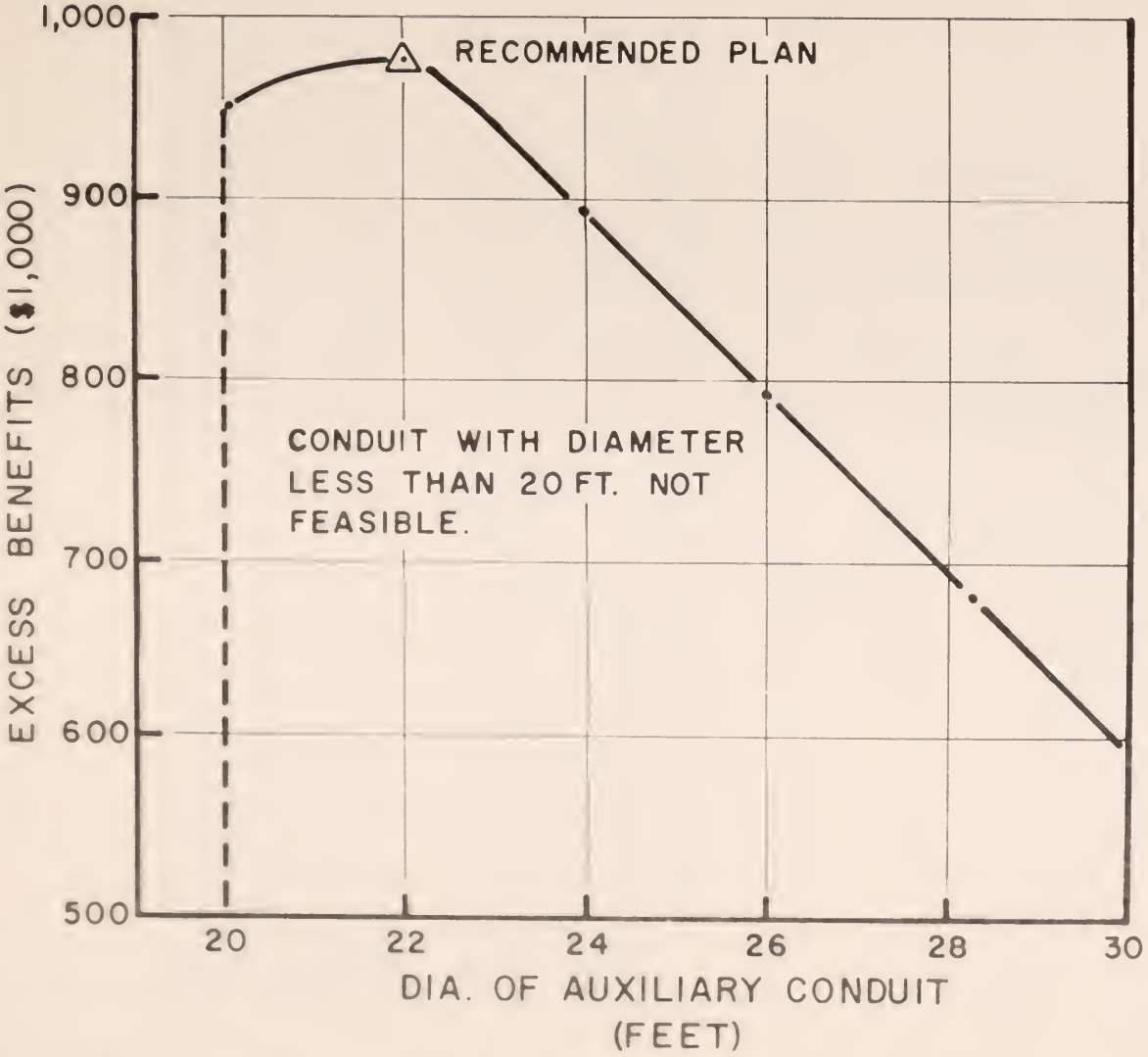
(2) Lands and damages and relocations.

The results of the studies are presented graphically on the following chart which shows a curve of excess annual benefits for various sizes of auxiliary conduit. The curve indicates that the point of maximization of benefits would be achieved with a 22-foot diameter auxiliary conduit. For any size conduit less than 20 feet in diameter, the excess benefits would be zero or negative.

The 22-foot diameter conduit selected would provide a high degree of flood protection in the densely populated and developed urban area of Hartford over the life of the project as well as reduce flood damages and losses in the headpool areas while maintaining a water surface elevation at or below 52 feet mean sea level which is compatible with existing conditions on the South Branch Park River. Further, the increase of one foot or more in water surface elevation in the headpool areas would inundate surrounding lowlands damaging valuable commercial and residential properties, railroad lines and roadways. This would decrease the business activity in the area, restrict access and cause extreme congestion by the loss of using the principal highways and roadways. With the construction of the 22-foot conduit, only minor modifications would be required by local interests to prevent flood damages in the headpool areas from a project design flood. The 22-foot diameter auxiliary conduit is recommended also as having the least social, economical and environmental impact on the headpool areas as well as imposing the least detrimental effects on the activities in the Hartford areas.

21. PUMPING STATIONS. - The Riverside pumping station would have a design capacity of 180 cfs equivalent to a runoff rate of 1.0 inch per hour from the 171 acre low level interior area. The Armory pumping station designed and partially constructed by the Connecticut State Highway Department and the Greater Hartford Flood Commission would have a capacity of 170 cfs to control runoff from about 8 acres of highway area, 14 acres of low level interior land area and flows from a combined storm and sewer line, In recent years the storm and sewer line was constructed to by-pass the pumping station and convey flows to a newly constructed sewerage treatment plant. The total design capacity of 350 cfs for both stations is considered to be more than required to control runoff in the project area. During the preparation of project design and Phase II GDM, a detailed study of the pumping requirements will be made and the design capacity of the pumping stations will be reanalyzed to determine the optimum use for each station.

Pumping will alleviate the occurrence of ponding of interior runoff from the low area or overflows from the high level areas during abnormally high flows in the rivers. With



PARK RIVER
LOCAL PROTECTION

EXCESS BENEFITS CURVE

MARCH 1973

the enclosure of the Park River in a conduit, the area adjacent to and over the river will increase in value due to economic development. In general, the area is comprised of lands below the 52 feet mean sea level contour. It is quite flat and development is quite evenly proportioned between interstate and local highway systems, moderate commercial and residential buildings, open fields and renewal areas. It is not economically feasible to reserve these areas for temporary storage of interior runoff during flood periods.

Interior drainage from approximately 1,380 acres is intercepted by the Park River and its branches between the entrances to the existing North and South Branch conduits and the entrance to the existing Park River conduit. Interior drainage facilities for the project would connect to and supplement the interior drainage system designed for the already completed conduit sections. The area controlled by the Riverside pumping station is comprised of 1209 acres of high level area which would be drained by pressure conduits during Park River flood periods and 171 acres of low level area which will drain by gravity during normal periods but will require pumping during periods of abnormally high flows in the river. As presently designed, the Armory pumping station would control about 22 acres of rapid runoff. The pumping stations are needed as an integral part of the Park River local protection works to realize the full flood control benefits of the project.

22. PROJECT FORMULATION. - Construction of the Park River Local Protection Project represents the optimum development for the preservation and enhancement of desirable features of the urban environment. Officials of the City of Hartford are very much concerned with the probability of again suffering extensive flood damages as experienced during the 1955 record flood or possibly from a storm similar in magnitude as that produced recently by Hurricane "Agnes". On numerous occasions local officials have indicated their willingness and readiness to financially participate in the construction of the project including extending the twin-box conduit north of Farmington Avenue as recommended in this report. The flood control features comprise the most feasible and economical solution to the flood problem. The variation of sizes for the auxiliary conduit was studied and, as previously explained, the 22-foot diameter tunnel will provide a high degree of protection for the densely urbanized community of Hartford and represents the maximum excess of tangible benefits over costs. During a project design flood, with the Connecticut River at a stage of 30 feet, m. s. l., the water surface at the conduit extension entrances would not exceed elevation 52 feet, mean sea level. The recommended project as modified is economically justified with a benefit to cost ratio of 1.5 to 1.0.

J. COORDINATION

23. COORDINATION WITH OTHER AGENCIES. - The following Federal, state and local agencies were asked to furnish their views and letters of comment received are included in Appendix A.

U. S. Dept. of Transportation, Federal Highway Administration
U. S. Environmental Protection Agency
U. S. Dept. of the Interior, Fish & Wildlife Service
U. S. Dept. of the Interior, Bureau of Outdoor Recreation
U. S. Dept. of the Interior, National Park Service
U. S. Dept. of Housing & Urban Development
U. S. Public Health Service
U. S. Dept. of Agriculture, Soil Conservation Service
U. S. Dept. of Commerce, New England Regional Commission
New England River Basins Commission
Conn. Dept. of Transportation, Bureau of Highways
Conn. Dept. of Environmental Protection
Conn. Dept. of Public Works
Conn. Dept. of Agriculture
Conn. State Dept. of Health
Metropolitan District, Hartford, Conn.
Greater Hartford Flood Commission
Hartford Redevelopment Agency
Mayor, City of Hartford
City Manager, City of Hartford

24. SUMMARY OF VIEWS. - Comments received from the above agencies are favorable to the project plan and were given consideration in the preparation of this report. The U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, coordinated their reviews with the Bureau of Outdoor Recreation, the National Marine Fisheries Service, and the Connecticut Department of Environmental Protection and indicated that there would be no enhancement opportunities or adverse fish and wildlife effects associated with the project.

The U. S. Dept. of the Interior, National Park Service noted that no historical sites were situated in the project area. The U. S. Dept. of Agriculture, Soil Conservation Service described the location and extent of channel improvements upstream of the project site and will continue to coordinate their flood control works in the Park River Basin with the Corps of Engineers. The U. S. Dept. of Transportation, Federal Highway Administration and the Connecticut Bureau of Highways

stated concern for the techniques to be used in the construction of the auxiliary conduit under Interstate Route 91 and other roadways and requested plans during the detailed design stage.

The Conn. Dept. of Environmental Protection recognizes the need for the project and expressed their intent to provide formal approval of the agreement. The Hartford Metropolitan District suggested future conferences and coordination to exchange views on detailed design of utility and drainage facilities. The Greater Hartford Flood Commission again expressed their intentions to participate in the construction of the project and recommended that the conduit be extended north of Farmington Avenue.

25. U. S. ENVIRONMENTAL PROTECTION AGENCY. - Advance copies of the Phase I - Plan Formulation report including the Environmental Statement dated 16 July 1971 were submitted to the Regional Administrator, Region 1, Environmental Protection Agency, for review. Their letter of comment dated 14 March 1973 is included in Appendix A as Exhibit 1. It was noted that the various impacts of the construction works such as noise and dust pollution as well as increased siltation caused by construction equipment and traffic congestion should be given consideration. Mitigative measures to minimize the adverse impact of the construction works on the local environment will be considered during project detailed design studies and included in the updated Final Environmental Statement.

K. ENVIRONMENTAL ANALYSIS

26. ENVIRONMENTAL CHARACTERISTICS. - The proposed project is located entirely within the city limits of Hartford, the capital and most populous city in the State of Connecticut. The natural environment has virtually disappeared as is the case in most similar areas. The pavement, residences, office buildings, industrial and business structures, highways and coincidental appurtenances typify the urban environment present in any large city.

The Park River once flowed in an open channel through this urban environment. Some of the river was later inclosed in conduits. There now are gaps between the sections of conduit, allowing the river to flow through deep open channels. The river water is a very poor quality, degraded by factory discharges, surface runoff, debris and various pollutants. Seven children lost their lives in the open channel between 1942 and 1968. Existing conditions result in low aesthetic values and high hazard potential.

There is a reach of about 1,600 feet of open channel between completed conduit Sections 3 and 6 presently causing erosion and endangering a high river bank within the public Pope Park area and adjacent streets. The park has been closed to the public due to the hazardous conditions along the river bank.

At present, the reach of the North Branch Park River extending northward from the completed conduit Section 8 at Farmington Avenue is open and winding. It meanders through an area to the rear of several apartment and professional buildings. During times of high water, flooding occurs along this reach, with resulting erosion of streambanks. The stream bed and banks are a depository for rubbish and junk carried there by the stream and discarded by people. Consequently, the area is unsightly and a continual source of aggravation to the users of the adjacent land.

27. PROJECT IMPACT. - The area involved in the Park River conduit project is already committed to urban uses. There is no possibility of a reversal of the urbanization process and a restoration of the natural environment which once characterized the area. However, it is possible to improve the aesthetics of the project area. An improvement will result from the elimination of unsightly and dangerous open channels, from project features of competent architectural and landscape design, and from the inclusion of public use features in the project wherever possible.

Indirectly, the project will have beneficial effects on the adjacent areas by providing an environment more conducive to businesses, recreation and residential uses because of the elimination of the open channels. It will be possible not only to reopen the park, closed down because of the conditions cited above, but also, it is intended to blend the park area with the project area. The local economy should benefit by the improved aesthetics in the area.

The pumping stations and headwall will be designed primarily according to the practical demands of the project but attention will be given to aesthetic details to provide architectural compatability with the surrounding area particularly in light of the urban environment.

The auxiliary conduit would be installed almost completely under existing streets. Therefore, no impairment of the aesthetics of the area above the conduit is foreseen. The proposed network of conduits, coupled with the pumping stations and headwall would have several beneficial results:

a. Minimization of the danger of flooding in the low-lying areas of Hartford, the destruction of developed properties and the existing hazards to life.

b. An upgrading of the urban environment due to the elimination of the open channels.

c. The improvement of pedestrian traffic conditions with the addition of walkways and benches over the new conduits.

A definite improvement environmentally will result from the project in the reach north of Farmington Avenue. A winding, debris-laden stream which continually floods, causing erosion and damage to adjoining parking areas will be contained. The land area made available over, and adjacent to the conduit (Section 9) will be graded to blend with the contiguous land areas, will be landscaped as suitable and will become a useful and visually pleasing asset.

During project construction noise, increased siltation and dust resulting from moving equipment and traffic congestion will be minimized and controlled as much as possible. Mitigative measures will be specified to minimize adverse impact on the local environment.

28. PUBLIC USE AND ENVIRONMENTAL ASPECTS. - During Phase I studies and investigations, consideration was given to the possibility that certain areas along the conduit right-of-way could be developed for certain limited public use activities. The matter was discussed with city of Hartford officials, with the intent of determining the attitude of the city toward such public use development and also the status of land within the right-of-way with respect to present or future proposed uses. The attitude of the city officials was favorable,and it was found that certain project areas might be available for limited public use development.

The types of public use development under consideration are small sit-in and walk through parks and landscaped connecting walks adjacent to existing park areas and other similar development. Possibilities for such development are limited because of the need for committing available areas over the conduit to parking and other practical uses. The engineering necessities arising during final design of the conduit itself are also limiting factors; for example: the final cross sections of the right-of-way with the conduit in place; the depth of fill (including topsoil) over the concrete conduit; cross sectional slope steepness; and surface drainage requirements.

Topsoiling, seeding, and landscape planting will be an integral part of the design to insure that the completed project is as visually acceptable as possible. Special attention will be afforded the reach of the river extending northerly from Farmington Avenue, so that the completed project will be compatible with the adjacent apartment buildings and adjoining lands. The lands within the conduit right-of-way will be designed and landscaped for harmonious blending with the area.

29. ENVIRONMENTAL IMPACT STATEMENT. - In compliance with the National Environmental Policy Act of 1969, a draft of the Environmental Impact Statement on the environmental aspects of the Park River Local Protection Project was submitted to the President's Council on Environmental Quality on 7 April 1971 and the final statement filed on 1 September 1971. A copy of the Environmental Statement dated 16 July 1971 is included as an attachment.

L. PROJECT PLAN

30. GENERAL. - The recommended plan of modifying the existing flood control project for Hartford, Connecticut is shown on Plate 2-2 consisting of conduit extension sections 2, 4, 5, 7 and 9; a junction structure; a concrete headwall and earth dike at the entrance to section 9 on the North Branch; an auxiliary conduit from the junction structure to the Connecticut River; and pumping stations near Riverside Street and the State Armory.

With the recommended plan of flood protection, occurrence of a standard project flood would result in ponding over a total of about 500 acres of land upstream of the conduit entrances. The water surface at the North and South Branch conduit extension entrances would rise to elevation 52 feet, mean sea level. Local interests will be required to maintain present volumes of storage above the conduit extension entrances through effective control and monitoring of the existing zoning and encroachment lines.

31. CONDUIT EXTENSIONS. - The conduit extension work includes two sections of twin-rectangular conduit (sections 2 and 4) enclosing 2,569 feet of the Park River; one section of twin-rectangular conduit (section 5) 103 feet in length on the South Branch; and two sections of twin-rectangular conduit (sections 7 & 9) enclosing 1,979 feet of the North Branch. Conduit extensions are shown in profile on Plate 2-3.

Conduit sections will be reinforced concrete structures as shown in detail on Plate 2-4 and 2-5. The inside dimensions of each barrel of the conduit for sections 2 and 4 will be 34 feet wide by 26.5 feet high; for section 5, 36 feet wide by 27.5 feet high; and for sections 7 and 9, 22 feet wide by 25 feet high.

32. JUNCTION STRUCTURE. - The junction structure, to be constructed of reinforced concrete, will serve to combine the flows from the North and South Branches and distribute them to the Park River and auxiliary conduits and thence to the Connecticut River. A model study is currently in progress by contract with Alden Research Laboratories, Worcester Polytechnic Institute to determine the shape and size of the junction structure.

33. NORTH BRANCH HEADWALL AND DIKE. - A reinforced concrete headwall will be constructed at the entrance to conduit section 9. An earth dike will be constructed between the headwall and high ground on either side of the conduit. The top elevation of the headwall and dike will be 54.5 feet, msl, the same as that of the headwall and dike constructed at the entrance to the South Branch conduit, and will provide 2.5 feet of freeboard.

34. AUXILIARY CONDUIT. - The auxiliary conduit will be a 22-foot inside diameter, circular cross-section reinforced concrete structure extending from the junction structure to the Connecticut River by way of Park Street, Wyllys Street, and Charter Oak Avenue, a total length of 9,100 feet. Plan, profile and sections are shown on Plate 2-6. About 6,000 feet of the conduit, principally under Park Street, will be a concrete-lined tunnel in bedrock. The remaining concrete conduit will be constructed by tunneling in earth and by open cut method. The lower end of the conduit will pass under highway I-91 and the existing Corps of Engineers' floodwall at the Connecticut River.

35. RIVERSIDE PUMPING STATION. - A pumping station will be located along the bank of the Park River adjacent to conduit section 4 in the vicinity of Riverside Street. Runoff will be conducted to the pumping station by pipes paralleling both segments of completed and the proposed conduit extension sections.

36. ARMORY PUMPING STATION. - The existing substructure for the Armory pumping station is located on the left bank of the Park River adjacent to the completed conduit section 1 and east of the State Armory. Work accomplished by the Connecticut State Highway Department and the Greater Hartford Flood Commission includes the substructure, four sluice gates and part of the interior drainage system.

Project features to complete the pumping station consist of the superstructure, pumps and equipment and part of the interior drainage system to control runoff.

37. LANDS AND DAMAGES. - The proposed sections of conduit will primarily fall within the banks of the Park River and the North Branch of the Park River, except that approximately 400 feet of the extension above Farmington Avenue will be located under private parking areas in order to eliminate an ox-bow in the North Branch River. The auxiliary conduit will be constructed principally within street rights-of-way. Wherever either conduit passes under private property, permanent easements will be secured.

The entire project will require that about 12 acres be taken in permanent easement of which about 9.5 acres are required for the auxiliary conduit subsurface easement. An additional area of about 9.5 acres has been acquired in fee by the Greater Hartford Flood Commission. Approximately 24 acres will be required for temporary construction easements of which about 9 acres are of public ownership and 15 acres of private ownership. A two-story brick garage will be acquired and five paved parking areas will be affected during construction.

38. RELOCATIONS. - Construction of the sections of conduit extensions will require the removal of the Broad Street, Flower Street, Laurel Street and Farmington Avenue bridges. Upon completion of the conduit, the highway pavement, sidewalks, drains and other appurtenances will be replaced in the same general locations with the grades adjusted to meet the changed conditions. The construction of Section 9 (above Farmington Avenue) will require the relocation of a 54-inch sewer line and portions of the 51-inch and 27-inch sewer lines connecting to the 54-inch line. At a number of locations, the drains, sewers, and utilities will be relocated outside the area required for construction of the conduits.

M. COST ESTIMATES

39. FIRST COSTS. - Unit prices used in estimating construction and relocation costs are based on average bid prices for similar work in the same general area, adjusted to the 1973 price level. Valuations of real estate are based on updating previous land costs and on recent appraisals of properties at the site and includes the additional costs for resettlement and acquisition as required under Public Law 91-646. All construction costs include an allowance of 20% for contingencies. Costs of engineering and design and of supervision and administration, are estimated lump sums based on experience, knowledge and evaluation of the site and project,

and comparison with similar projects in the area. The total first cost of the project is estimated at $53,000,000. A summary of costs for project features is given in Table 2 and a detailed breakdown of quantities and unit prices is included in Appendix B.

40. ANNUAL CHARGES. - Average annual charges also summarized in Table 2, are based on total investment costs including interest during construction and an interest rate of 3-1/4 percent amortized over the 100-year assumed economic life of the project. The Greater Hartford Flood Commission furnished satisfactory assurances by letter dated 15 April 1969 in conjunction with the Water Resources Council's policy on revised interest rate for water resources projects. (See Appendix A, Exhibit 15.) Allowances are made for costs of maintenance and operation and for interim replacement of equipment having an estimated life of less than 100 years.

TABLE 2

SUMMARY OF COSTS AND ANNUAL CHARGES
(1973 Price Level)

Project Features	Estimated Cost
Land and Damages	$ 1,100,000
Relocations	500,000
Pumping Stations	1,400,000
Conduit Extensions	17,500,000
Auxiliary Conduit	25,300,000
Engineering & Design	3,900,000
Supervision & Administration	3,300,000
Total Estimated First Costs	$ 53,000,000
Annual Charges	
Interest and Amortization	$ 1,883,000
Maintenance and Operation	50,000
Major Replacements	40,000
TOTAL ANNUAL COSTS	$ 1,973,000

41. COST APPORTIONMENT. - First costs to local interests are estimated at $1,600,000 including lands and damages and relocations. The Federal first cost of the project is estimated at $51,400,000. Annual costs for maintenance and operation of the project which are

items of local responsibility are estimated at $90,000 including $40,000 for interim replacements of equipment.

42. COMPARISON OF ESTIMATES. - The current cost estimate of $53,000,000 reflects an increase of $1,200,000 since the last reported estimate in the PB-3 of 1 July 1972 which amounted to $51,800,000. Table 3 outlines and explains the changes.

TABLE 3

COMPARISON OF ESTIMATES

Project Feature	Project Document	PB-3(1972)	Current	Change
01. Lands & Damages	$ 630,000	$ 1,120,000	$ 1,100,000	- $ 20,000
02. Relocations	170,000	280,000	500,000	+ 220,000
13. Pumping Stations	480,000	800,000	1,400,000	+ 600,000
15.1 Conduit Extensions	9,400,000	16,000,000	17,500,000	+ 1,500,000
15.2 Auxiliary Conduit	16,360,000	27,500,000	25,300,000	- 2,200,000
30. Engineering & Design	2,090,000	3,230,000	3,900,000	+ 670,000
31. Supervision & Adm.	1,970,000	2,870,000	3,300,000	+ 430,000
		(1)	(2)	
TOTAL COST	$ 31,100,000	$ 51,800,000	$ 53,000,000	+ $1,200,000

(1) The cost increase in construction features between the project document and the PB-3 (1972) was based on price escalation from 1966 to 1972. The E&D and the S&A cost increases were due to reanalysis of requirements and to Federal pay increases.

(2) Changes from the 1972 PB-3 estimate are due to the following two major causes:

a. A reanalysis of construction costs based on current practices resulted in a reduction in the cost estimate for the auxiliary conduit.

b. Modifications to the authorized plan consisting of construction of conduit Section 9 and completion of the Armory Pumping Station result in higher costs for all items except auxiliary conduit. The increase in cost of lands and damages due to Section 9 extension was offset by an overall decrease based on current appraisals and changed site conditions.

N. ECONOMICS

43. GENERAL. - The city of Hartford, the most populous city in Connecticut, is the state Capitol and the financial and trade center of the state. With roots deep in both state and national history, it is one of the country's oldest cities and also one of its most attractive.

Having a 1970 population of 158,000, Hartford is the core city of an SMSA with over 660,000 people and registering as 49th in population of all the SMSA's in the country. The economy of the SMSA has a broad base in manufacturing and finance, especially insurance, and in per capita income it ranks sixth in the country. The SMSA has one of the faster growth rates in population in the country (about 2.5% compounded annually for the period 1950-1970) and is projected to continue to grow in both population and physical size.

44. LAND USE. - Based on the 1970 Census, Hartford has a gross population density of 8,495 per square mile but the figure is misleading. With 2,765 acres of its area devoted to parks and 2,800 acres in the North and South Meadows area devoted to transportation, mixed government and commercial facilities, the true population density of the rest of the city is approximately 16,000 per square mile. With such densities, developable land is at a premium and urban renewal, both public by the City's Redevelopment Administration and private under the auspices of major local banks and insurance companies, is a continuing process in Hartford.

The portion of the Park River Basin in which the authorized project is to be constructed is prime land for such redevelopment. Other than the flood problem the area has advantages which few other sections of Hartford can approach. Running westerly approximately a mile from the grounds of the State House to the confluence of the Park River North and South Branches and then extending about a mile on the North Branch and a quarter of a mile on the South Branch, the flood plain is currently given over to an aging mix of commercial and industrial properties. Located only a three or four minute drive from Hartford's Central Business District and served by Interstate Highway I-84 (access from the area at two locations) the area has a potential for much higher utilization of its land than is currently the case. Adding to its amenities the flood plain is bounded on the south by Pope Park, a large urban park of 73 acres. There are currently about 30 acres of cleared land (Underwood-Urban Renewal Area) abutting the park planned for early development by a private developer and the City's Redevelopment Authority.

45. FLOOD LOSSES. - A field review of the flood loss potential of the Park River below the confluence of its north and south branches and along the lower reaches of its branches was carried out by damage analysts in the fall of 1972. The review found that the largest single source of loss at the time of the report on which the project document is based, a large industrial plant (Underwood Company) has been razed. The tract of land on which the plant stood has been acquired by one of the state's largest real estate developers. The land is currently zoned for industrial development but both the developer and the City's Redevelopment Agency are trying to change the entire area to commercial zoning permitting high rise apartment development, shopping center type development, or a mix of the two. Firm plans for the area are not completed at this time.

The field review also found changes in use of two buildings and that another building had been razed and a new office building was being erected on its site. Near the confluence of the North and South Branches a new shopping center of 9 acres has been constructed and is subject to floods rarer than the 25-year event. Total annual losses in the studied reaches of the river amount to $1,480,000 under 1972 conditions.

An analysis was made of the annual losses in the new 9-acre shopping center alone. Such annual losses amount to $85,400 or $9,490 an acre. It is realistic to assume that development in the Underwood-Urban Renewal area would have a loss potential at least equal to the shopping center, so that annual losses for the 30 acres in the area feasible for development will amount to $284,700. Development is expected to start concurrently with the flood control project and be completed in 6 years, so that the average annual equivalent value of the loss with interest at 3-1/4% would be $262,200.

For the properties other than in the Urban Renewal area, the loss potential will increase with time as the forces of competition and the demand for land generated by the population densities previously noted will mean a constant up-grading of properties to attain highest and best use of the land. In the Connecticut River Comprehensive Report (1970) the growth in flood loss potential was equated to the growth in real income in the area. For the Connecticut portion of the basin, the average annual equivalent value of the growth in real income was a factor of 0.393 using an interest rate of 4-7/8%. With an interest rate of 3-1/4 percent, this factor would of course be higher in any event but the locational and amenity values of this area are, as previously noted, so high that a much greater growth factor is in order. Losses are projected to grow at a rate equal to 30% of the growth in personal income over the next 50 years.

Hartford is in the Water Resources Planning Area 107, Hartford-Springfield of the North Atlantic Regional Water Resources Study for which personal income has been projected in constant 1958 dollars from 1970 through 2020. This data used in projecting losses with an average annual equivalent value of the growth derived at 0.66 amounts to an increase in loss potential of $976,800. Total annual losses in the studied reaches of the Park River amount to $2,719,000 consisting of $1,480,000 to current development, $976,800 average annual equivalent losses due to future growth and $262,200 average annual equivalent losses to development in the Underwood-Urban Renewal area.

46. BENEFITS. - Annual benefits are measured by the difference between average annual losses under conditions without flood protection and those that would result under conditions expected over the project life after its construction. Closing the gaps in the existing conduit and provision of an auxiliary conduit 25 feet in diameter to carry the excess flows in the larger floods would accrue flood damage prevention benefits annually of $2,450,000 consisting of $1,340,000 to present damages, $884,000 in average annual equivalent values due to projected growth and $226,000 in average annual equivalent value in the Underwood-Urban Renewal area.

As an index of the effects of floods exceeding the capacity of the existing conduit and flooding downtown Hartford, data was obtained from the Hartford Clearing House on the dollar volume of daily transactions. At the present time the daily clearings are in excess of $30,000,000.

A flood of a magnitude which exceeded the conduit capacity would take from 5 to 7 days to recede in the North and South Meadow areas of Hartford. Over and above the damages caused by the flood in the flood plain proper, there would be a large decrease in the business activity of Hartford because of the lack of access from the east of Hartford and the extreme congestion caused by the loss of use of the area's principal north-south route through the Meadows. This decrease would be directly measured by the clearing house receipts. While it is estimated that some 90 percent of the decreased activity would represent simply a deferral, the other 10 percent would be lost forever. Therefore, such a flood would cause business losses in Hartford of $15,000,000 to $21,000,000 over and above the losses in the flood plain. On an annual basis this amounts to $180,000. Construction of the auxiliary conduit would prevent these losses.

In the reaches of the stream between Broad Street and Capitol Avenue on the Park River and between Laurel Street and Interstate Route I-84 on the North Branch, the area over the conduit can satisfy an urgent need for parking for employees of the industries and commercial ventures along the river. This use is incidental to normal conduit usage. Over 10 acres of space formerly used for parking in this area has been taken by the State for construction of Interstate Route I-84. The State Highway Department and the Hartford-Traffic Commission have already entered into an agreement whereby space under the over-passes and interchanges on Route I-84 will be leased to the City on nominal terms and be adapted to parking. This will do little to alleviate the parking problem because of the various configurations and limited amount of such space. Moreover, the locations at interchanges and local street over-passes will aggravate the traffic problem on the local ways because of access and egress from the parking areas into congested traffic.

An investigation was made into the rate of annual earnings for parking space for several New England cities including Hartford, as a measure of the value of the parking space available on top of the conduit. Information was received from State and municipal authorities and private operators on rates of return from public metered lots leased to private operators and privately-owned and operated facilities. The annual rate varied from $.45 a square foot for metered parking in a Boston suburb to $3.00 per square foot for private lots in Boston. In Hartford, the net annual return per square foot for parking amounts to $1.00 under current conditions. There are 160,000 square feet of conduit surface on which parking will be available. The estimated annual benefit amounts to $160,000.

The total tangible annual benefits to the project amount to $2,790,000 based on the provision of a 25-foot diameter auxiliary conduit. Adjustments to estimated losses in the headpool areas were made to increase the storage pool elevation from 49.8 feet to 51.8 feet, mean sea level and provide a 22-foot auxiliary conduit. Negative benefits were derived and deducted from the $2,790,000. The adjusted total tangible annual benefits to the recommended project providing a 22-foot diameter auxiliary conduit amount to $2,740,000.

47. REDEVELOPMENT BENEFITS. - Senate Document No. 97 of the 87th Congress directs that where areas have been designated as Redevelopment Areas by the Redevelopment Administration, the project benefits shall be considered as increased by the value of the labor and other resources required for project construction and expected to be used

in project operations, project maintenance and added area employment during the life of the project to the extent that such labor and resources would - in the absence of the project - be unutilized or underutilized.

The City of Hartford has been designated as a Title IV Redevelopment Area under P. L. 89-136 by the Economic Development Administration of the U. S. Department of Commerce. A sizeable proportion of the construction industry's work force is unemployed and the project will draw its workers from this pool.

The records of this office indicate that on the average civil works project, the labor cost approximates 27 percent of total construction cost. It is noted that a large part of this project consists of a tunnel which normally requires a special work crew so the total cost is not to be used. However, only about half of the tunnel will be driven, the rest will be cut and cover or normal construction. The construction cost involved will therefore be $20 million of normal construction and one-half of the $25 million tunnel cost or a total of $32. 5 million. The estimated labor component is 27 percent of $32. 5 million or $8. 775 million.

It is regular practice for a contractor to bring a skeleton crew of his own men on to a job and fill the rest of his requirements from the local labor pool. It is estimated that 75 percent of the laborers will be locally hired for this project. While not all of the labor put to work will come from the rolls of the unemployed, the jobs that they leave will be filled by people from the unemployed or under-employed rolls so that the entire 75 percent is used. It is estimated that the work will take three years to complete. With interest at 3-1/4 percent the derivation of the annual redevelopment benefit is as follows:

$8. 775 x . 75 = $6. 58125 million

1st yr. 1. 58125 x PW_1 = . 9685 = 1, 531, 490

2nd yr. 2. 5 x PW_2 = . 9380 = 2, 345, 000

3rd yr. 2. 5 x PW_3 = . 9085 = 2, 271, 200

Total P. W. $6, 147, 690

Annual Benefit = $6, 147, 690 x (CRF - 3-1/4% - 100 yrs.) . 033883 = $208, 302

Called $208, 000

A benefit for unemployed labor put to work for maintenance and operation of the completed project is not claimed as the city will do this with their own regular force.

48. SUMMARY OF BENEFITS. - A summary of the total average annual benefits creditable to the project for flood control based on completing the conduit extensions, a 22-foot diameter auxiliary conduit and appurtenant works, are set forth below:

Benefit Category	Amount
Flood Damages Prevented	$2,450,000
Business Activity	180,000
Parking Facilities	160,000
Total average annual benefits providing a 25-foot dia. auxiliary conduit	$2,790,000
Negative benefits based on estimated additional losses in headpool areas	- 50,000
Adjusted total average annual benefits providing a 22-foot dia. auxiliary conduit	$2,740,000
Redevelopment Benefits	208,000
TOTAL AVERAGE ANNUAL BENEFITS	$2,948,000

49. ECONOMIC ANALYSIS. - A summary of average annual costs, average annual benefits and the benefit-cost ratio for the Park River Local Protection Project is shown in Table 4.

TABLE 4

SUMMARY OF COSTS AND BENEFITS

First Costs

Federal	$	51,400,000
Non-Federal		1,600,000
Total First Cost	$	53,000,000

Annual Costs

Federal		$ 1,826,000
Non-Federal		147,000
	Total Annual Costs	$ 1,973,000
Annual Benefits		$ 2,948,000
Benefit-Cost Ratio		1.5 to 1.0

O. LOCAL COOPERATION

50. GENERAL. - In accordance with Section 3 of the 1936 Flood Control Act, as amended, local interests will be required to provide the items of local cooperation as outlined in the Project Document and included in Paragraph 4 of this report. Three additional requirements of local cooperation and participation responding to changes since project authorization are that local interests will replace the roadway, walks and utilities at Farmington Avenue, alter and relocate buildings, utilities, highways and facilities necessary for project construction, and comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P. L. 91-646.

51. LOCAL ASSURANCES. - A request for formal assurances from the Greater Hartford Flood Commission and the State of Connecticut will be made after approval of the Phase II - General Design Memorandum. Construction of the Park River Local Protection Project will require non-Federal interests furnish assurances imposed by the authorizing document and current additional requirements satisfactory to the Secretary of the Army that they will:

a. Provide, without cost to the United States, all lands, easements, and rights-of-way required for construction and operation of the works, including lands for pumping stations and spoil disposal areas;

b. Hold and save the United States free from damage due to the construction works;

c. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army;

d. Upon completion of the conduit construction, replace pavements, sidewalks, drainage and other appurtenances, including those at Broad Street, Flower Street, Laurel Street and Farmington Avenue, and bear the cost of removal, replacement, and modification to sewers, drains, utilities, or highways beyond the area required for excavation and construction of the projects;

e. Prevent changes in the headpool ponding areas which would decrease the effectiveness of the improvements and if ponding areas and capacities are impaired, promptly substitute equivalent storage capacity;

f. Undertake all practical measures to prevent pollution from entering the Park River conduit system;

g. Provide without cost to the United States all alterations and relocations of buildings, utilities, highways and other facilities made necessary by construction of the project;

h. Comply with the requirements specified in Sections 210 and 305 of Public Law 91-646, 91st Congress, approved 2 January 1971 entitled "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970."

52. MEASURES BY LOCAL INTERESTS. -

a. Flood Plain Zoning. - Local interests have established zoning ordinances and encroachment lines up to elevation 52 feet, mean sea level, in the headpool areas above the conduit entrances on the North and South Branches. The Greater Hartford Flood Commission controls new developments, use, or filling within the designated flood plains. Permits for such action are issued and approved by the Commission and users of the flood plains must provide equivalent water storage capacity before encroaching upon the headpool ponding areas.

b. Armory Pumping Station. - In addition to the construction of conduit Sections 1, 3, 6 and 8, the Connecticut State Highway Department and the Greater Hartford Flood Commission jointly constructed the substructure for the Armory Pumping Station including four sluice gates and a portion of the low-level drainage system at a cost of $233,000. Since Section 2 of the conduit extension was not constructed and interior runoff would continue to flow into the open river section, the pumping station could not be utilized for flood control. Work was delayed pending construction of conduit Section 2. Completion of the Armory pumping station will be accomplished as part of the local flood protection works in conjunction with the construction of conduit Section 2.

c. Sanitary and Storm Sewers. - The Metropolitan District Commission and the city of Hartford have a continuing program, starting about ten years ago, of separating the sanitary sewers and the storm drains. The capacity of the existing sewage treatment plant was increased to handle larger flows resulting from heavy rainfall. These measures reduce pollution entering the Park River conduit system.

d. Land Acquisition. - Real estate required for the construction of conduit extension sections 2, 4, 5 and 7, the junction structure and the Riverside Street pumping station have been acquired by the Greater Hartford Flood Commission at a cost of about $300,000. The Hartford Court of Common Council accepted and approved all the assessments of benefits and damages against the owners of properties affected by the extension of the Park River conduit. The layout of the land taking was adopted by the Court of Common Council on 9 October 1961 and amended on 8 October 1962.

53. VIEWS OF LOCAL INTERESTS. - Meetings have been held with local officials to keep them advised of the flood control features of the project, to exchange ideas, and to keep them informed of the total estimated project cost and non-Federal costs. The general plan, project features and project costs were outlined and discussed at the Public Meeting held on 17 October 1972 in Hartford, Connecticut.

Officials of the City of Hartford, the Greater Hartford Flood Commission and the Connecticut State Department of Environmental Protection have expressed their intentions and willingness to cooperate and participate in the local flood protection works by their letters of concurrence included in Appendix A as Exhibits 2, 3, 4 and 15. Local officials have also demonstrated outstanding initiative by constructing highway improvements and pumping stations compatible with long term flood control measures. The strong interest indicated by local business and civic groups reinforces the intent of local officials to fulfill the requirements of local participation.

54. NON-FEDERAL COSTS. - Non-Federal estimated costs amount to $1,600,000 including $1,100,000 for lands and damages and $500,000 for relocations. Interest during construction is estimated at $78,000. Non-Federal interests will pay the total investment cost amounting to $1,678,000. Upon completion, the local protection works will be maintained and operated by the Greater Hartford Flood Commission at an annual cost currently estimated at $90,000.

The Greater Hartford Flood Commission located at 550 Main Street, Hartford, Connecticut, 06103, is responsible for fulfillment of the costs and requirements of local cooperation and participation acting in the name and on behalf of the City of Hartford. Honorable George A. Athansen, present Mayor of Hartford, desires construction and completion of the flood control system and has indicated his intentions of providing the necessary funds to the Commission. Local interests are very willing and able to meet the requirements and costs of non-Federal participation.

P. DEPARTURES FROM THE AUTHORIZED PLAN

55. DEPARTURES. - The following modifications and changes from the project document were made during investigations to reaffirm and/or reformulate the authorized plan:

a. The proposed headwall south of Farmington Avenue on the North Branch Park River was eliminated and conduit Section 9 has been added extending from the north end of Section 8 to a point about 935 feet north of Farmington Avenue. A concrete headwall and earth dikes would be provided at the north end of conduit Section 9.

b. The Armory pumping station designed and partially constructed by the Connecticut State Highway Department and the Greater Hartford Flood Commission would be completed at Federal cost as part of the local flood protection works. Remaining work to be accomplished consists of the superstructure, furnishing and installing pumps and equipment, and constructing the unfinished portion of the drainage facilities.

56. REASONS FOR DEPARTURES.

a. The construction of conduit Section 9 would prevent flooding and damages along the reach of the North Branch Park River north of the Farmington Avenue roadway and along this main and busy traffic artery. In addition, the conduit extension would assure a high degree of flood protection to this remaining highly developed urban area. The inadequate waterway opening of the Farmington Avenue bridge would be removed eliminating a restriction to flood flows which otherwise would remain with construction of a headwall at the authorized location.

The Section 9 conduit extension with headwall and dikes in the upstream area in lieu of the authorized headwall at Farmington Avenue, would eliminate other economic and adverse social and environmental effects as well as disruptive project features subjecting the Corps to critical review. Justification of the conduit extension, Section 9, is included in Section I of this report, Plan Formulation.

b. The Armory pumping station is needed as an integral part of the Park River local flood protection works to realize the full flood control benefits of the project. The pumping station would control runoff and interior drainage which would otherwise pond over the conduit extensions and adjacent lands. Detailed studies will be made during the Phase II - GDM to determine the optimum use and capacity for the Armory Pumping Station in conjunction with the Riverside Pumping Station.

Q. STATEMENT OF FINDINGS

I have reviewed and evaluated, in light of the overall public interest, the documents concerning the proposed action, as well as the stated views of other interested agencies and the concerned public, relative to the various practicable alternatives in accomplishing local flood protection along the Park River and the North and South Branches in the city of Hartford, Connecticut.

The possible consequences of these alternatives have been studied according to environmental, social well-being, and economic effects, including regional and national development and engineering feasibility.

In evaluation, the following points were considered pertinent:

a. Environmental Considerations. From an environmental standpoint, I have selected the optimum plan which will afford more enhancement than adverse effects. The recommended project will have beneficial effects on flood control, water quality, pollution, aesthetics, land traffic, recreation and urban development. The impact of the recommended project on the natural environment would be negligible as most of the Park River is already enclosed in conduits. Only minimal vestiges of a natural environment remain and no possibility exists for a reversal in the urbanization process and restoration of the natural environment. The connecting sections of conduit will improve the aesthetic quality of the area by eliminating open channels as well as have a beneficial effect on the water quality by cutting down on material added to the river from erosion. The recommended project will also have beneficial effects by allowing more area available for development as business, residential

or recreational areas. Overall, the project would minimize the danger of flooding in the low-lying areas of Hartford, along with the destruction and hazards associated with flooding; resulting in an upgrading of the urban environment and aesthetics as well as improving pedestrian and vehicular traffic over the conduits. The project offers no opportunity to benefit fish and wildlife resources, nor will it have any adverse effects upon these resources. No adverse environmental effects are known or anticipated if the project is implemented. However, increased siltation and temporary turbidity is expected during construction. Measures will be taken to hold these effects to a minimum. In addition, some vegetation will be destroyed in the area of the channel improvement and this condition will prevail until revegetation is accomplished.

b. Social Well-Being Considerations. I find that the overriding social well-being consideration in the Hartford area is the reduction of the flood hazard that has caused tremendous damages and human suffering as well as restricted normal and higher utilization of land within the city. The recommended project will provide a high degree of protection resulting in greater community cohesion and ensuring availability of public facilities during times of flooding. Construction of the flood control improvements will make possible higher utilization of the area for the planned urban renewal and redevelopment projects which will improve the physical and social environment of not only the project site, but the entire Hartford area. Enclosure of the open channel sections will also eliminate a serious safety hazard which has accounted for seven drownings in the past.

c. Engineering Considerations. From an engineering standpoint, I have selected the project that would provide the highest degree of flood protection feasible because of the highly urbanized nature of the project area. Although constraints exist on increasing the size of the twin-rectangular concrete conduit sections, flood control excess benefits have been maximized to determine the most economical and feasible size for the auxiliary conduit. I have selected the size of a 22-foot diameter auxiliary conduit as having the least social, economical and environmental impact on the headpool areas as well as imposing the least detrimental effects on the activities in the Hartford area. The recommended project was found to be the most practical method of meeting the flood control needs in the Hartford area. Other considered project alternatives including non-structural measures did not meet the criteria and requirements for various economic, social and environmental reasons.

d. Economic Considerations. From an economic standpoint, I have selected the economically optimum plan by providing a high degree

of flood protection and enhancement of social well-being and economic growth. The recommended project will have a net effect of increasing employment, tax revenues, and property values and will preserve and stimulate further growth in the protected area.

e. Other Public Interest Considerations. I find that the desires of local interests as well as the repeated requests for extending the existing conduit Section 8 north of Farmington Avenue, are feasible and economically justified based on a combination of tangible and intangible benefits. This extension of the flood control improvement will enhance the social well-being and economic and environmental aspects in the Hartford area.

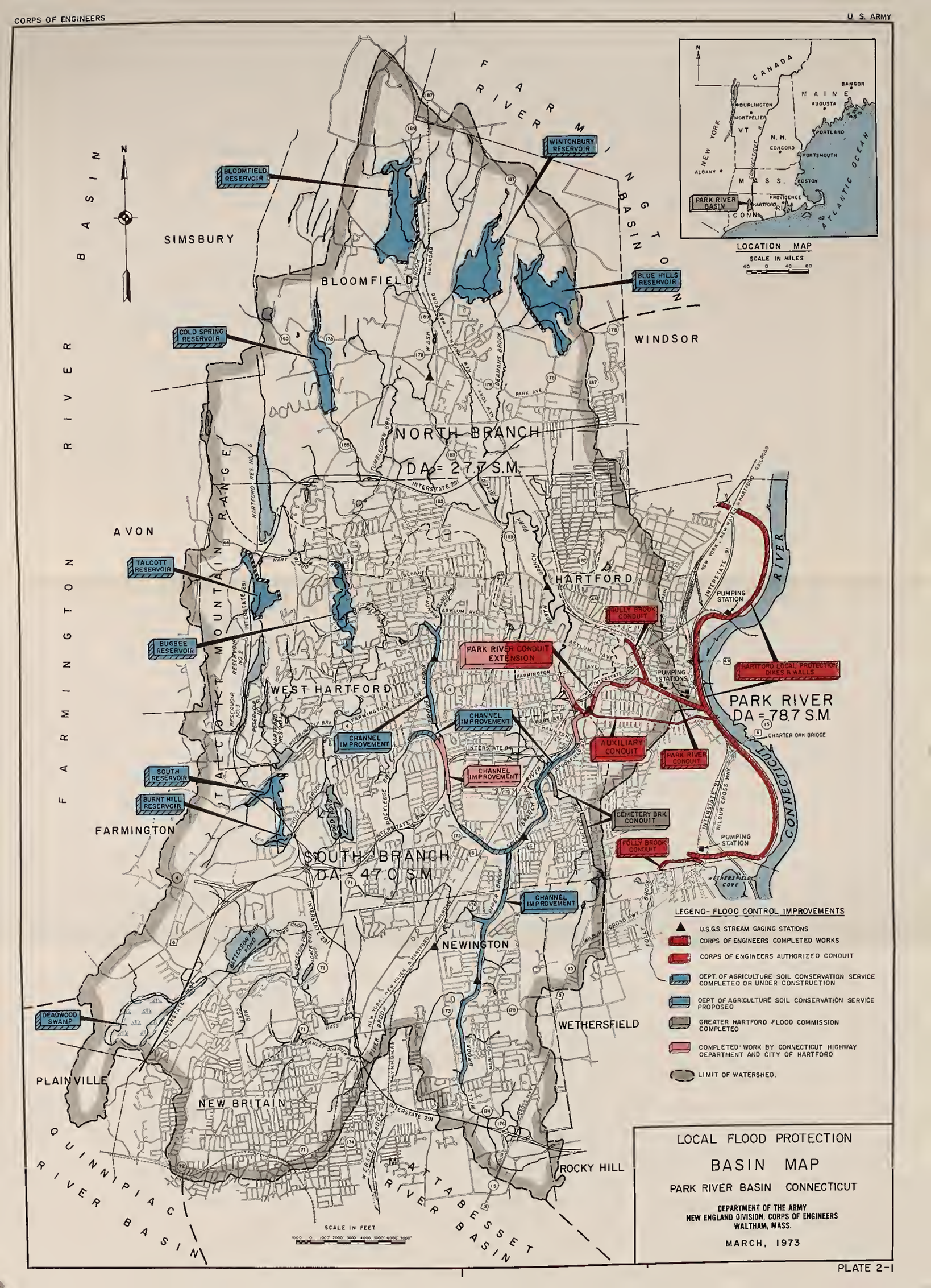
I find that the proposed action, as developed in the Plan Formulation and Recommendations, is based on thorough analysis and evaluation of various practicable alternative courses of action for achieving the stated objectives; that wherever adverse effects are found to be involved they cannot be avoided by following reasonable alternative courses of action which would achieve the Congressionally specified purposes; that where the proposed action has an adverse effect, this effect is either ameliorated or substantially outweighed by other considerations of national policy; that the recommended action is consonant with national policy, statutes, and administrative directives; and that on balance the total public interest should best be served by the implementation of the recommendations.

John H. Mason

JOHN H. MASON
Colonel, Corps of Engineers
Division Engineer

R. RECOMMENDATION

57. TREATMENT RECOMMENDED. - It is recommended that the project plan, consisting of twin-rectangular conduit extension sections along the Park River, the North Branch and a short section on the South Branch; a junction structure; pumping stations; a headwall and dike on the North Branch; and the auxiliary conduit; submitted in this memorandum, be approved as the basis for preparation of the Phase II-General Design Memorandum for the Park River Local Protection Project. It is further recommended that the departures from the project document of extending the conduit and headwall north of Farmington Avenue on the North Branch Park River and of completing the Armory Pumping Station be approved.



LOCAL FLOOD PROTECTION

BASIN MAP

PARK RIVER BASIN CONNECTICUT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

MARCH, 1973

CORPS OF ENGINEERS

U. S. ARMY

HEADWALL, INLET STRUCTURE AND DIKE

SECTION 9 Length 935'

HEADWALL

SECTION 8 Length 2760'

APPROXIMATE LIMIT OF 1955 FLOOD

SECTION 7 Length 1044'

SECTION 6 Length 1460'

HEADWALL

SECTION 5 Length 103'

SECTION 3 Length 1710'

ARMORY PUMPING STATION

SECTION 2 Length 1232'

SECTION 4 Length 1337'

RIVERSIDE PUMPING STATION

JUNCTION STRUCTURE

AUXILIARY CONDUIT

(EXISTING) GULLY BROOK CONDUIT

SECTION 1 Length 1213'

(EXISTING) PARK RIVER CONDUIT

BUSHNELL PARK PUMPING STATION

KEENEY LANE PUMPING STATION

POTTER ST. PUMPING STATION

DIKE

FLOOD WALL

CONDUIT OUTFALL

DIKE

FLOOD WALL

DIKE

BULKELEY US RTE 44 BRIDGE

FOUNDERS BRIDGE

PARK RIVER CONDUIT EXTENSION

NORTH BRANCH PARK RIVER

SOUTH BRANCH PARK RIVER

PARK RIVER

CONNECTICUT RIVER

ATLANTIC OCEAN

PARK RIVER BASIN

LOCATION MAP

SCALE IN MILES 40 0 40 80

PROJECT FEATURES

PARK RIVER CONDUIT EXTENSION
CONDUIT SECTIONS 2,4,5,7,9
JUNCTION STRUCTURE
RIVERSIDE AND ARMORY PUMPING STATIONS
HEADWALL & DIKE - NO. BR. AUXILIARY CONDUIT

SCALE IN FEET 500' 0 500' 1000'

SCS, DEPT. OF AGR. CHANN. IMP.

LEGEND:

- Approximate Limit of 1955 Flood.
- Corps of Engineers, Proposed Plan.
- Completed Work by Connecticut Highway Department and City of Hartford.
- Existing Pumping Stations.
- Proposed Pumping Station
- To Be Completed
- Proposed Modifications (All Other Work Same As Authorized Plan)

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY | CK. BY

SUBMITTED:
CHIEF, SECTION
APPROVAL RECOMMENDED:
CHIEF, TECH. ENG. BRANCH
REVIEWED:
PROJECT ENGINEER
APPROVAL RECOMMENDED:
CHIEF, BRANCH

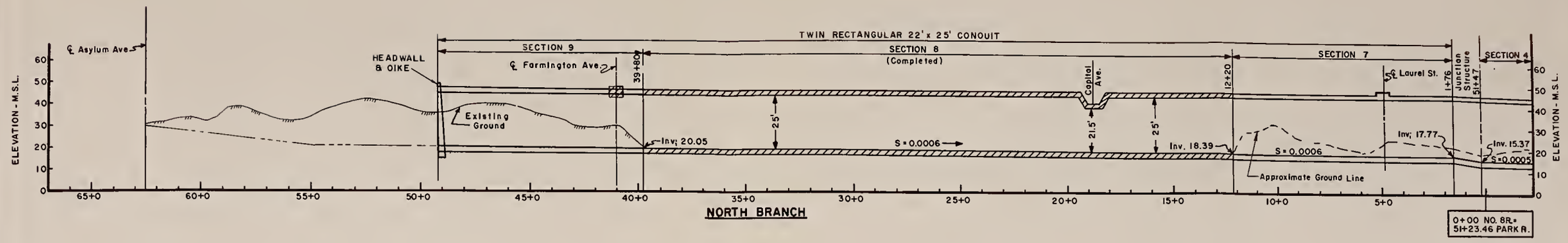
WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
MODIFIED PLAN
HARTFORD CONNECTICUT
APPROVED DATE
CHIEF, ENGINEERING DIVISION

SCALE | SPEC. NO.
DRAWING NUMBER
SHEET

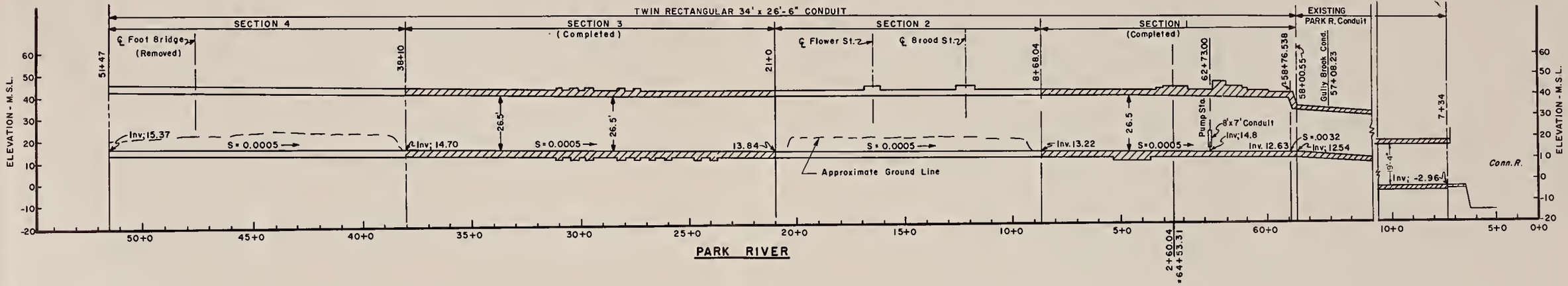
PLATE 2-2

CORPS OF ENGINEERS

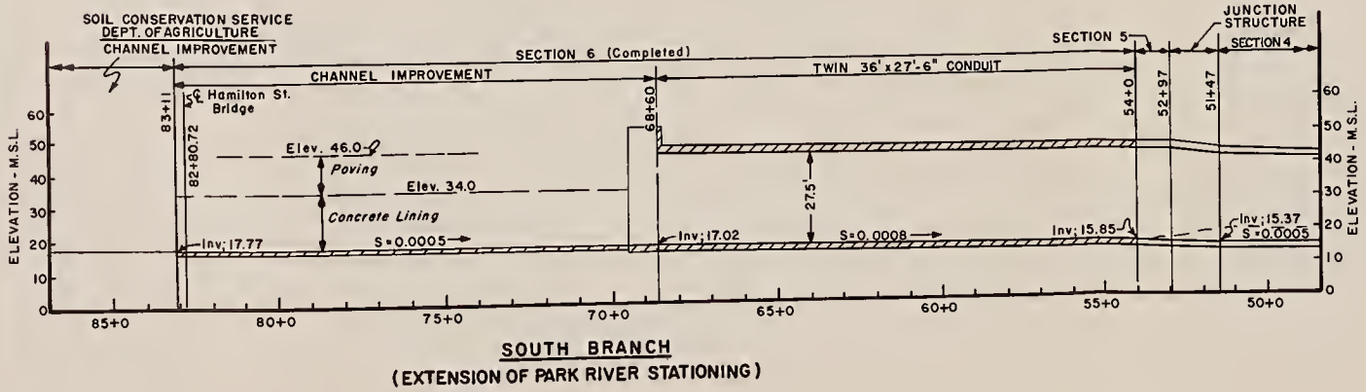
U. S. ARMY



NORTH BRANCH



PARK RIVER



SOUTH BRANCH
(EXTENSION OF PARK RIVER STATIONING)

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY | TR. BY | CK. BY

PROJECT ENGINEER

WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION

PROFILES

HARTFORD CONNECTICUT

SUBMITTED BY: CHIEF, PLANNING BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION
DATE

SCALE

DRAWING NUMBER

SHEET

PLATE 2-3

CORPS OF ENGINEERS

U. S. ARMY

N

SECTION 3
Length 1710'

SECTION 2
Length 1232'

SECTION 1
Length 1213'

TAKING LINE

TAKING LINE

TAKING LINE

TAKING LINE

INTERSTATE HIGHWAY No. 84

SIGOURNEY ST.

CAPITOL AVENUE

CAPITOL AVE.

FLOWER ST.

ARMORY

To Armory Pumping Station

CURVE 'A'

CURVE 'B'

CURVE 'C'

CURVE 'D'

CURVE 'E'

CURVE 'F'

CURVE 'G'

CURVE 'H'

CURVE 'I'

13' Storm Siphon

15" RC Pipe

48" RC Pipe
(To be Removed)

48" RC Pipe

42" C Pipe

18" C Pipe

24" RC Pipe

36" RC Pipe

42" L.J. Pipe

36" L.J. Pipe

48" L.J. Pipe

Sanitary Siphons

COLUMBIA ST.

BABCOCK ST.

LAWRENCE ST.

BROAD ST.

HUNGERFORD ST.

PUTNAM ST.

URBAN RENEWAL AREA

PARK PARK TERRACE

MATCH LINE TO PLATE 2-5

LAUREL ST.

WOODBINE ST. (To be abandoned)

RIVERSIDE ST.

PARK ST.

SECTION 4
Length 1337'

RIVERSIDE STREET
PUMPING STATION

Foot Bridge
(Removed)

JUNCTION
STRUCTURE

SO. WOODBINE ST.
(To be abandoned)

SECTION 7
Length 1044'

SECTION 6
Length 1460'

SECTION 5
Length 103'

AUXILIARY CONDUIT
(FOR DETAILS SEE PLATE 2-6)

72" RC Pipe

84" RC Pipe

18" RC Pipe

18" L.J. Pipe

15" Sanitary Siphon

PLAN
SCALE 1" = 100'

SECTION 5
SCALE 1" = 10'

SECTION 2
SCALE 1" = 10'

SECTION 4
SCALE 1" = 10'

TYPICAL HALF SECTIONS

NOTE:
For Typical Section for Sections 7 & 9 See PLATE 2-5

LEGEND

COORDINATES - CURVE DATA - BASE LINE STATIONS
PARK RIVER CONDUIT EXTENSION

Curve	P.I. Coordinates N	P.I. Coordinates E	R	Δ	T	L	P.C. Sta.	P.T. Sta.
A	150,666.738	165,512.823	200.00'	69°49'-03"	138.27'	241.96'	8+68.04	11+10.01
B	151,011.741	165,025.778	200.00'	22°16'-14"	39.37'	77.74'	15+29.23	16+06.97
C	151,187.499	164,267.005	200.00'	35°49'-00"	64.23'	125.02'	22+81.33	24+06.85
D	150,996.095	163,811.115	200.00'	30°41'-31"	54.89'	107.14'	27+81.78	28+88.92
E	150,671.998	163,571.998	200.00'	12°39'-13"	22.18'	44.17'	32+15.20	32+59.37
F	150,043.686	163,292.846	200.00'	8°57'-08"	15.66'	31.25'	39+08.67	39+39.92
G	149,757.341	163,216.510	200.00'	8°57'-08"	15.66'	31.25'	42+04.96	42+36.21
H	149,016.199	163,138.940	200.00'	35°57'-37"	101.82'	188.36'	48+63.92	50+23.28
PARK RIVER STA. 51+23.460 = NO. BRANCH STA. 0+00.0 COORD. N 148,929.530 E 162,989.215								
I	148,900.000	162,681.000	200.00'	33°10'-34"	59.577'	115.806'	2+50.05	3+65.86

LEGEND:

Corps of Engineers, Modified Plan.

Completed Work by Connecticut Highway Department and City of Hartford.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY

PROJECT ENGINEER

SUBMITTED BY

CHIEF, PLANS & SPT. BRANCH

WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
DETAIL SHEET NO. 1
HARTFORD CONNECTICUT

APPROVED DATE

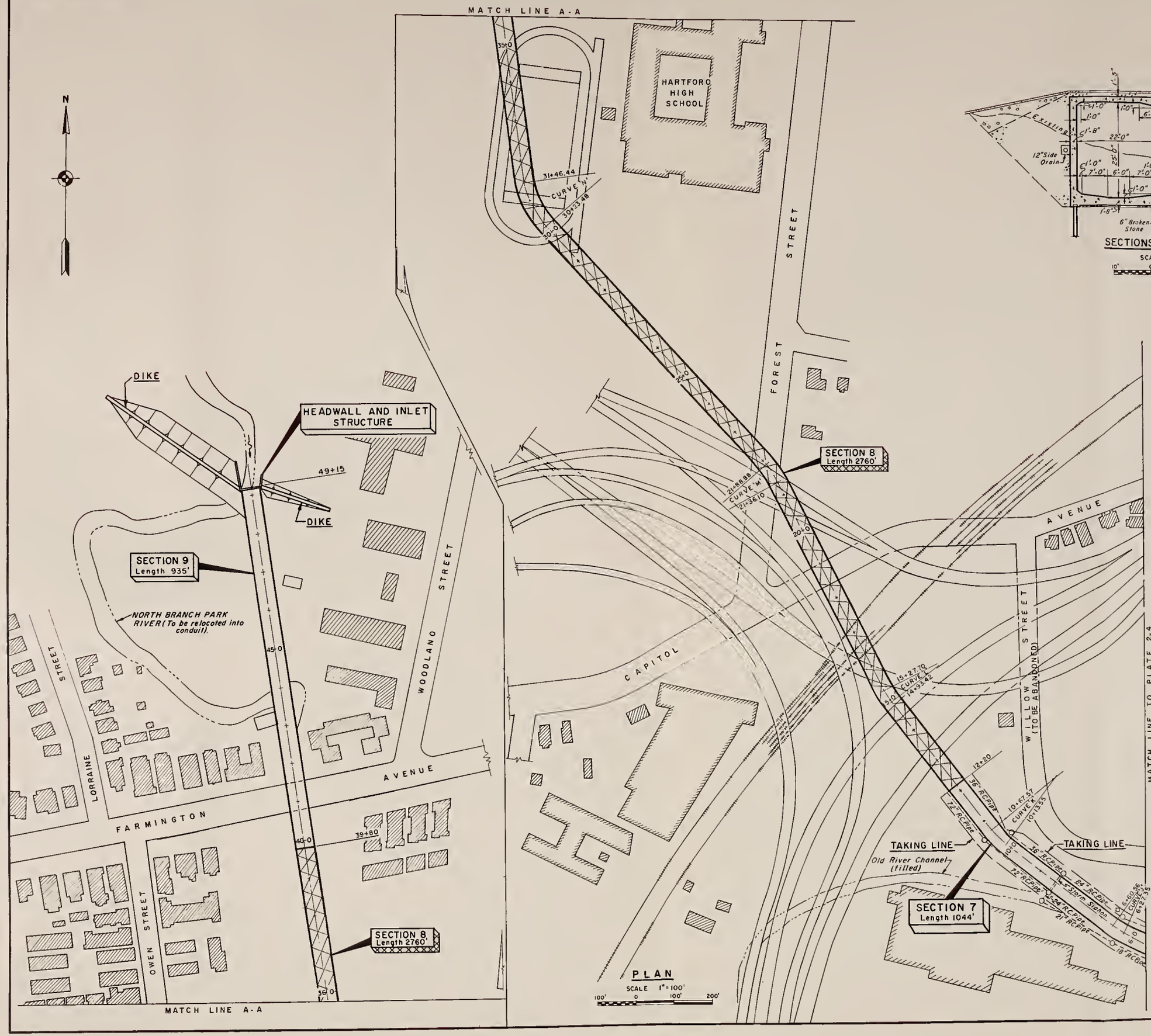
CHIEF ENGINEERING DIV.

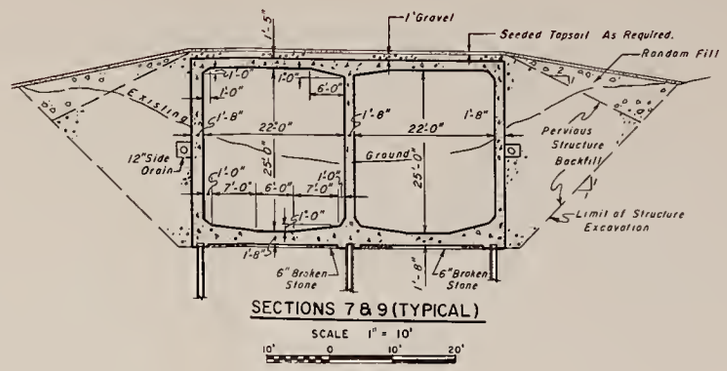
SCALE: AS SHOWN

DRAWING NUMBER

SHEET

PLATE 2-4





SECTIONS 7 & 9 (TYPICAL)

SCALE 1" = 10'

10' 0 10' 20'

LEGEND

COORDINATES - CURVE DATA - BASE LINE STATIONS
PARK RIVER CONDUIT EXTENSION

Curve	P.I. Coordinates N	P.I. Coordinates E	R	Δ	T	L	P.C. Sta.	P.T. Sta.
J	149,057.000	162,382.000	200.00'	9°-30'-47"	16.642'	33.207	6+27.350	6+60.557
K	149,297.000	162,066.000	200.00'	15°-28'-30"	27.174	54.018	10+13.548	10+67.566
L	149,671.000	161,781.000	200.00'	9°-49'-12"	17.181	34.279	14+93.424	15+27.703
M	150,249.500	161,480.000	200.00'	15°-07'-22"	26.550	52.790	21+36.095	21+88.883
N	150,930.000	160,854.000	200.00	35°-13'-37"	63.490	122.955	30+23.482	31+46.438

LEGEND:

Corps of Engineers Modified Plan

Completed Work by Connecticut Highway Department and City of Hartford

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY | TR. BY | CK. BY

PROJECT ENGINEER

SUBMITTED BY

CHIEF, PLANN. & RPTS. BRANCH

WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
DETAIL SHEET NO. 2

HARTFORD CONNECTICUT

APPROVED DATE

CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN

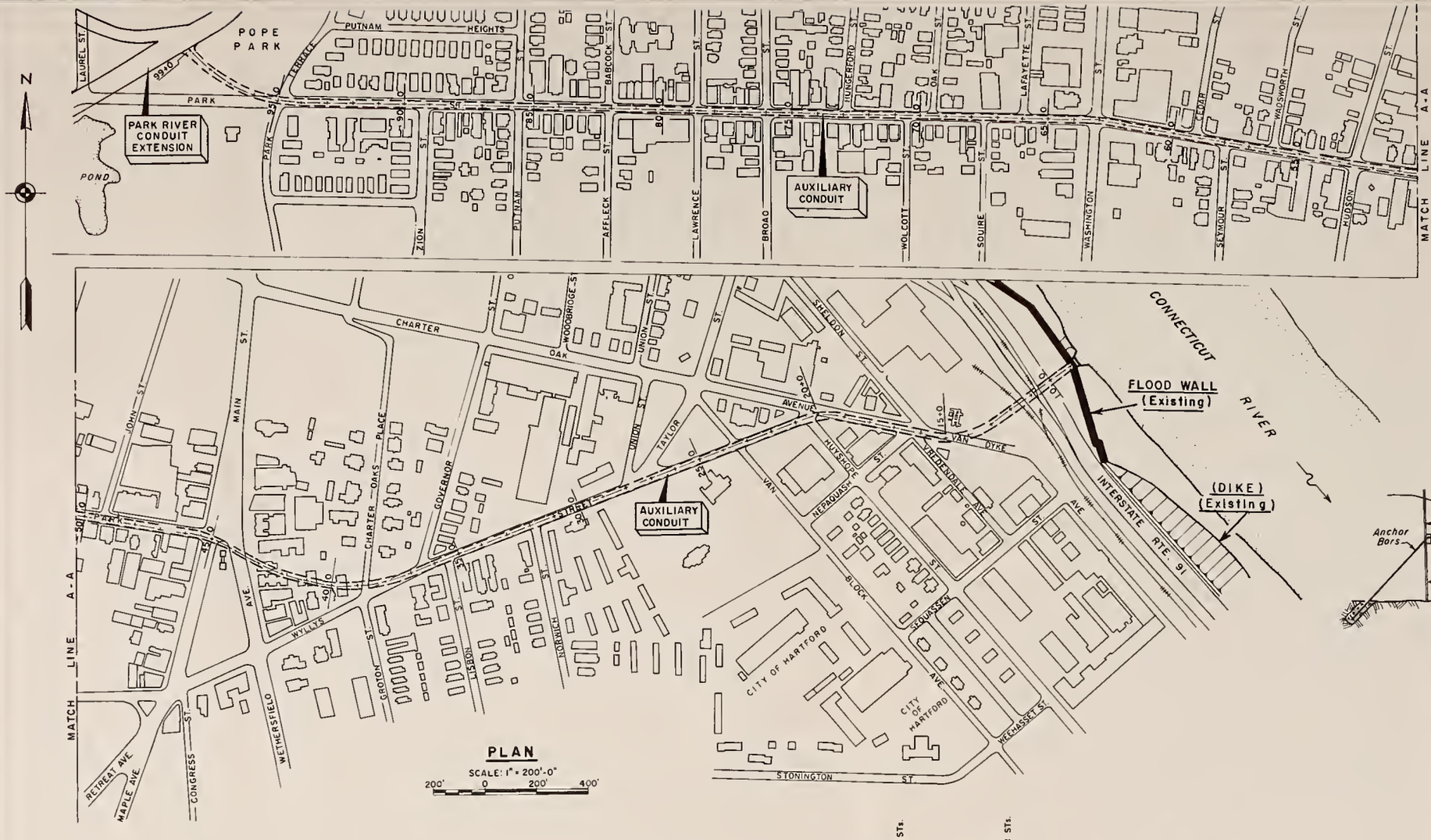
DRAWING NUMBER

SHEET OF

PLATE 2-5

CORPS OF ENGINEERS

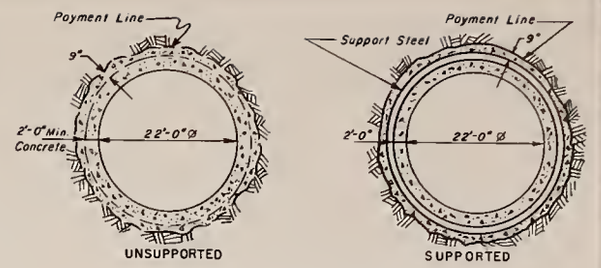
U. S. ARMY



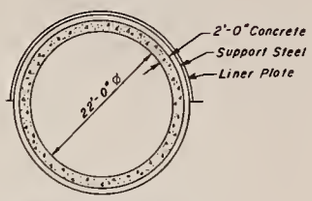
PLAN

SCALE: 1" = 200'-0"

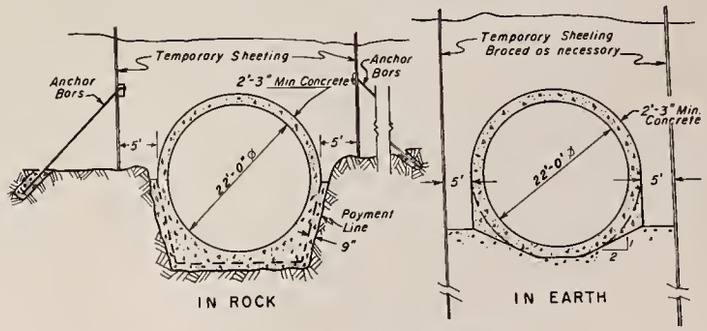
200' 0 200' 400'



TUNNEL IN ROCK



TUNNEL IN EARTH

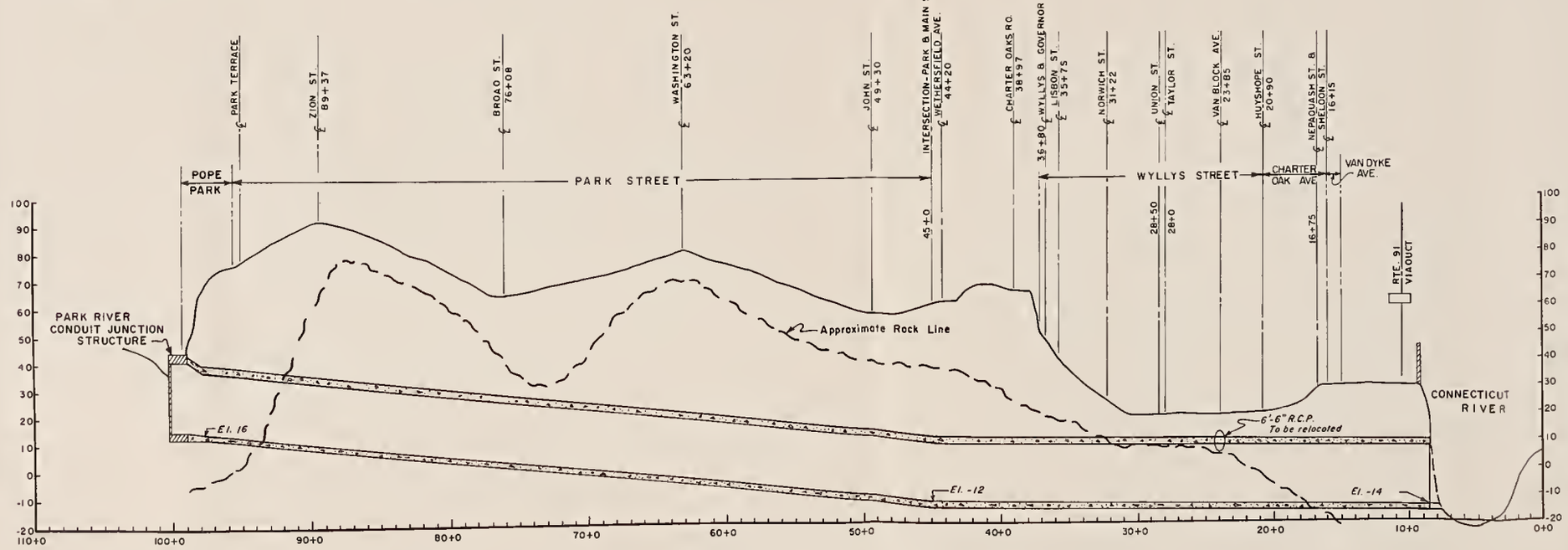


CUT & COVER CONDUIT

AUXILIARY CONDUIT TYPICAL SECTIONS

SCALE 1" = 10'-0"

10' 0 10' 20'



LEGEND:

Corps of Engineers, Modified Plan.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY | TR. BY | CK. BY

PROJECT ENGINEER

SUBMITTED BY

CHIEF, PLANN. & RP.T.S. BRANCH

WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION

PLAN, PROFILE AND SECTIONS

HARTFORD, CONNECTICUT

APPROVED DATE

CHIEF ENGINEERING DIV.

SCALE AS SHOWN

SHEET

PLATE 2-6

APPENDIX A

LETTERS OF COMMENT AND CONCURRENCE

APPENDIX A

LETTERS OF COMMENT AND CONCURRENCE
PARK RIVER LOCAL PROTECTION
HARTFORD, CONNECTICUT

CONTENTS

LETTER DATED	AGENCY	EXHIBIT
14 March 1973	U. S. Environmental Protection Agency	1
16 Jan 1973	Conn. Department of Environmental Protection	2
14 Nov 1972	City of Hartford	3
2 June 1972	Greater Hartford Flood Commission	4
24 Oct 1972	U. S. Dept. of the Interior, Fish and Wildlife Service	5
3 July 1972	Conn. Department of Transportation	6
30 June 1972	The Metropolitan District, Hartford	7
30 June 1972	U. S. Department of Agriculture, Soil Conservation Service	8
29 June 1972	U. S. Department of Transportation, Federal Highway Administration	9
15 Aug 1972	Conn. Department of Agriculture	10
21 Aug 1972	U. S. Department of the Interior, National Park Service	11
5 July 1972	U. S. Department of the Interior, Bureau of Outdoor Recreation	12
11 Sept 1972	Department of Housing and Urban Development	13
3 July 1972	Connecticut Public Works Department	14
15 April 1969	Greater Hartford Flood Commission	15

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING - ROOM 2303, BOSTON, MASSACHUSETTS 02203

March 14, 1973

Mr. John W. Leslie, Chief
Engineering Division
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

We have reviewed the Design Memorandum No. 2, Phase I -- Plan Formulation for the Park River Local Protection Project; Hartford, Connecticut. We found no changes in the plan that would alter our previous comments on this project concerning water quality. We do feel, however, that as a part of the plan formulation, the various impacts of the construction itself should be considered. Noise from construction equipment, increased siltation and dust resulting from earth-moving and traffic congestion are several of these potential problems. The noise, dust and traffic problems are critical due to the location of the work in a densely populated area. The severity of these problems might be minimized through regulating the timing of the work. We recommend that such mitigative measures be considered to minimize adverse impact on the local environment.

We appreciate the opportunity to comment on this plan and would like to keep informed of its progress.

Sincerely yours,

Wallace E. Stickney

Wallace E. Stickney, P.E.
Chief
Environmental Impact Branch

EXHIBIT 1

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

January 16, 1973

Colonel John H. Mason
Division Engineer
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Re: Park River Local Protection Project
Hartford, Connecticut

Dear Colonel Mason:

After a careful review of the above-referenced project, we are satisfied that the proposed project will have little or no adverse environmental effects upon the area scheduled for improvement.

The need for completion of this vital flood control link in the protection of such a highly urbanized area is recognized by the Department of Environmental Protection.

I am sure that you can expect the state's cooperation in a formal approval of the project when the project agreement is submitted by the Greater Hartford Flood Commission.

At your service,

Dan W. Lufkin
Commissioner

EXHIBIT 2

CITY OF HARTFORD

COURT OF COMMON COUNCIL

550 MAIN STREET

HARTFORD, CONNECTICUT

(203) 566-6710

CLERK
ROBERT J. GALLIVAN

COUNCILMEN
LLIN BENNETT
CHOLAS R. CARBONE
LLIAM A. DIBELLA
RY M. HESLIN
GER B. LADD
ORGE LEVINE
LYN A. MARTIN
CHARD SUISMAN
RGARET V. TEDONE

November 14, 1972

This is to certify that at a meeting of the Court of Common Council, November 13, 1972, the following RESOLUTION was passed.

WHEREAS, The City of Hartford in 1959 approved a flood control system along the Park River, such system only partially completed because of lack of funds; and

WHEREAS, In 1968 although Congress authorized completion of this project the necessary appropriations to carry it out were not made; and

WHEREAS, Renewed interest in the completion of this project may succeed in obtaining required federal funds; and

WHEREAS, Affirmative interest on the part of Council is necessary before The Army Corps of Engineers can submit a favorable report to Congress and thus be allowed to continue with its design phase such a design phase at no cost to the City; now, therefore, be it

RESOLVED, That the Court of Common Council repeat its expression of interest in seeing the Flood Control Project completed in order to protect the lives and investments of the citizens of Hartford.

Attest:

Robert J. Gallivan

Robert J. Gallivan,
City Clerk

Copies to: City Manager, Deputy Mayor Heslin, Greater Hartford Flood Commission and The Army Corps of Engineers.

EXHIBIT 3

GREATER HARTFORD FLOOD COMMISSION
550 MAIN STREET
HARTFORD, CONNECTICUT 06103
TELEPHONE 566-6608

sioners
OLD F. KEITH
RGE B. KINSELLA
~~ES V. MURRAY~~
N C. PARSONS
VARD PINNEY
NEL H. PUTNAM
LIAM J. REYNOLDS

June 2, 1972

HAROLD F. KEITH
Chairman
GEORGE B. KINSELLA
Vice Chairman
H. WARD PINNEY
Secretary
GEORGE E. HEPPNER
Director
~~ALEXANDER A. GOLDFARB~~ Joseph A. Lorenzo
Counsel

Colonel John H. Mason
Deputy Division Engineer
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Mason:

Thank you for your letter of 18 May 1972 advising us that the Park River Local Protection Project, authorized by the Flood Control Act of 1968, Public Law 483, 90th Congress, is presently under design. This is good news for the Greater Hartford Flood Commission and the City of Hartford.

It is my understanding that because of the lapse of time since the original Park River Report was made, it will be necessary to first review and restudy the entire project before design can be completed.

In the original study, the Corps of Engineers found it unfeasible to extend the North Branch Conduit across Farmington Avenue. It was proposed to end the North Branch Conduit about seventy-five feet south of Farmington Avenue and construct a headwall extending partly along the south street line of Farmington Avenue.

The City of Hartford and the Greater Hartford Flood Commission feel that there are advantages to extending the Conduit to at least the north side of Farmington Avenue. One big advantage would be that Farmington Avenue would be protected from flooding under design conditions. Farmington Avenue is one of the City's main east-west traffic arteries. Present design conditions estimate ponding beyond the end of the Conduit to elevation 52 m.s.l. Since the existing roadway on the Farmington Avenue Bridge is at about elevation 50 m.s.l., under the standard project flood, this street, one of the City's busiest major arteries, would be flooded to a depth of two feet. If this were to happen, it could be very difficult to explain to the public why Farmington Avenue was not protected.

The present Farmington Avenue Bridge has a rather limited waterway opening. During the flood of August 1955, the bridge acted partly as a dam during the high flows. Under present conditions, a design flood would probably go over Farmington Avenue, even with a low Connecticut River stage which might lower the theoretical ponding elevation to considerably less than elevation 52 m.s.l.

TO: Colonel John H. Mason
Corps of Engineers

June 2, 1972

The present Farmington Avenue Bridge is built on piles. It carries two major water mains besides other utilities. The construction of Conduit to within about seventy-five feet of the south street line has lowered the water level along the south edge of the bridge, so that the piles are now probably deteriorating due to wetting and drying. It is only a matter of time before this bridge will have to be replaced, in any event. By extending the Conduit across Farmington Avenue and constructing the proposed headwall north of Farmington Avenue, this important arterial street can be protected from possible interruption.

On behalf of the Greater Hartford Flood Commission and the City of Hartford, I urge your agency to reconsider the location of the proposed headwall on the North Branch Park River Conduit.

In my letter of April 18, 1966 to Colonel Remi O. Renier, Acting Division Engineer, I assured the Corps of Engineers that the required local co-operation, as outlined in his letter of March 24, 1966, would be forthcoming. I know the City of Hartford still needs and wants the flood protection which will be provided by this project, and that there will be no problem in securing whatever local co-operation will be required to bring this project to a successful conclusion.

I wish to assure you that the Greater Hartford Flood Commission and the City of Hartford appreciate the continued interest you and the Corps of Engineers have shown in Hartford's flood problem. I trust that the Congress of The United States will see fit to appropriate funds so that this project may be brought to an early and successful completion.

Very truly yours,

Harold F. Keith
Chairman

HFK:mm
cc: Honorable George A. Athanson, Mayor

EXHIBIT 4

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
U. S. POST OFFICE AND COURTHOUSE
BOSTON, MASSACHUSETTS 02109

OCT 24 1972

Division Engineer
New England Division
U. S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Sir:

This is in reply to your letter of June 19, 1972, requesting our comments on the proposed Park River Local Protection Project in Hartford, Connecticut. The project was authorized by the Flood Control Act of 1968, Public Law 483, 90th Congress. This report was prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-666 inc.). It has been reviewed by and has the concurrence of the Bureau of Outdoor Recreation and the National Marine Fisheries Service. It has also been coordinated with the Connecticut Department of Environmental Protection.

We understand the proposed work consists of constructing 3,716 feet of conduit, a junction structure, a headwall, an auxiliary conduit, and a pumping station.

We have determined that there would be no enhancement opportunities or adverse fish and wildlife effects associated with this work. Therefore, we do not object to the construction of the project as described.

We appreciate the opportunity to comment on your plans.

Sincerely yours,

Willard M. Spaulding Jr.

ACTING Regional Director

EXHIBIT 5

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
24 WOLCOTT HILL ROAD P.O DRAWER A WETHERSFIELD CONNECTICUT 06109

FICE OF THE
MMISSIONER

July 3, 1972

r. John W. Leslie
hief, Engineering Division
epartment of the Army
ew England Division, Corps of Engineers
24 Trapelo Road
altham, Massachusetts 02154

ear Mr. Leslie:

Re: Park River Local Protection
Project - Hartford, Connecticut

his will acknowledge your letters of June 19, 1972, to Commissioner Wood and to he Bureau of Highways inviting comments concerning the proposed Park River Local rotection Project at Hartford.

s you noted in your letters sections 1, 3, 6 and 8 were built across and along arts of the Park River in conjunction with Interstate 84. The other sections, junction structure, headwall, auxiliary conduit and pumping station are proposed o supplement and extend the existing protective structures. The general plan submitted with your letters outlines the proposed work.

It is considered that the proposed conduit sections 2, 4, 5 and 7, the junction structure and the pumping station can all be constructed without interference with Interstate 84, other State highways or with the New Haven to Hartford section of the Penn Central Railroad.

Preliminary engineering for Interstate 484, known as the Bushnell Connector, between Interstate 84 near the State Armory and Interstate 91 near the existing Park River conduit outfall is underway and will, in many places, be located over the top of the conduit. Mr. S. T. Bothwell, Sr. of our Department has been in contact with Mr. Frank Fogarty of your office concerning Interstate 484. Any necessary strengthening or bridging of the conduit will, of course, be coordinated between our designers and the Army Engineers.

The proposed auxiliary conduit crosses Interstate 91 and tracks of the Valley Division of the Penn Central Railroad in the vicinity of the corner of Charter Oak and Van Dyke Avenues. The design for these crossings will require coordination with our Bureau of Highways and Bureau of Rail and Motor Carrier Services.

The proposed headwall at the north end of the Park River conduit extension (section 8) is located just south of Farmington Avenue on State property which may be required for construction of a connector from Farmington Avenue to Interstate 84 to relieve local traffic congestion. As shown on your plan, the proposed headwall would interfere with our construction of such a connector. Your plan also shows dotted lines indicating that an expressway might be extended at a later date north of Farmington Avenue, up the valley of the north branch of

the Park River. There are no plans for the foreseeable future to construct such an expressway to the north of Farmington Avenue and it is recommended that your general plan be revised to remove the possibility that some who view the plan might so interpret our future intentions. When traffic studies are completed we will advise you of our highway needs so that the proposed headwall may be designed without interference with roadways, which may be required for a future Farmington Avenue connector.

In order to assist us in the further study of your proposed project it is requested that you provide us with two copies of the report referred to in paragraph one of your letters. Thank you for the opportunity of commenting on your proposed plans.

Very truly yours,

George S. Koch

George S. Koch
Deputy Transportation Commissioner
Bureau of Highways

TER SUPPLY
EWERAGE
GUG/rel

TELEPHONE
278-7850

THE METROPOLITAN DISTRICT

HARTFORD PLAZA - P. O. BOX 800
HARTFORD, CONN. 06101

June 30, 1972

Attention of NEDED-R

Mr. John Wm. Leslie
Chief, Engineering Division
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

We are indeed glad to learn from your letter of June 19, 1972, that you are currently under design on the remaining sections of the Park River Local Protection Project and the 22-foot diameter auxiliary conduit.

Rather than put various comments, recommendations, etc., on matters which will affect both our Bureau of Public Works and Water Bureau in a letter, we suggest that an early across-the-table conference be arranged, preferable at our Headquarters here in Hartford, to discuss these matters in some detail.

In my own personal view, much more can be accomplished at the start of design of a project by an across-the-table discussion, rather than by letter.

Arrangements for such a session can be made by phone by calling either the undersigned, Mr. Arthur Sweeton or Mr. H. A. Phillips.

Sincerely yours,

Gilbert U. Gustafson

Gilbert U. Gustafson
District Manager

cc: AWS
ERH
HAP
RGR
GUG

EXHIBIT 7

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Mansfield Professional Park, Storrs, CT 06268

June 30, 1972

Mr. John Wm. Leslie, Chief
Engineering Division
U. S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Dear Mr. Leslie:

Your letter of June 19, 1972 and the accompanying map regarding the preliminary plans for the proposed local protection project on the North and South Branches - Park River has been received.

The Soil Conservation Service and the local sponsor have completed channel works of improvement on the South Branch-Park River from Hamilton Street to Newfield Avenue in accordance with the Work Plan approved in March 1961.

Under construction at the present time and due for completion during this construction season is the section of Trout Brook from the Penn Central Railroad Bridge upstream to the vicinity of South Quaker Lane in West Hartford. A contract has been awarded to construct the intervening section of the channel from Newfield Avenue to the Penn Central Railroad Bridge on Trout Brook. The Newfield Avenue Bridge is to be rebuilt by the City of Hartford in the future, but no construction is planned at present.

A portion of Piper Brook, immediately tributary to the South Branch-Park River, will be constructed to Soil Conservation Service design requirements by the town of West Hartford Redevelopment Agency south to the Newington town line. A portion of this proposed work in the vicinity of New Britain Avenue, is to be constructed in conjunction with the Soil Conservation Service contract mentioned above.

On Rockledge Brook, a tributary of Trout Brook, a short section of a closed conduit has been constructed.

Four floodwater retention structures and a natural retention basin, Deadwood Swamp, have been completed and are under operations and maintenance control by the Sponsor.

The remaining channel improvements to be installed in accordance with the Work Plan are located in the upper reaches of Piper Brook and Mill Brook in Newington, and another section of Trout Brook in West Hartford. Current Soil Conservation Service policy is to re-examine those proposed works of improvement to determine whether or not changes in the watershed and

environmental considerations affect the feasibility and economic justification of the planned protection works. This review will be accomplished during fiscal year 1973.

This summarizes the activity of the Soil Conservation Service in the Park River Watershed. We have no specific comments on the proposed Park River Local Protection Project referred to in your letter.

We shall be pleased to continue our cooperation with your department and other federal, state and local agencies involved. If we can be of further assistance, please let us know.

Sincerely,

Robert T. Hilliard

Robert L. Hilliard
State Conservationist

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
990 Wethersfield Avenue
Hartford, Connecticut 06114

June 29, 1972

Department of the Army
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

IN REPLY REFER TO
01-06.2

Dear Mr. Leslie:

Our primary concern would be the portion of the conduit passing under Interstate Route 91 between the steel pile bents. A set of semi-final plans for this particular area would be appreciated when design has progressed to this stage.

It is our understanding that Mr. Bothwell of the State Department of Transportation has been in contact with Mr. F. W. Fogarty, Chief, Operations Division on review of preliminary drawings for Project 63-135, Interstate Route 484.

Sincerely yours,

A. J. Siccardi

A. J. Siccardi
Division Engineer

EXHIBIT 9

STATE OF CONNECTICUT
DEPARTMENT OF AGRICULTURE
STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

THOMAS J. MESKILL
GOVERNOR

JOHN T. MACDONALD
COMMISSIONER

F. P. FUTTNER
DEPUTY COMMISSIONER

August 15, 1972

NEDED-R

Mr. John Wm. Leslie, Chief
Engineering Division
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

Thank you for your letter of June 19, 1972 regarding the proposed local protection project involving the Park River in Hartford.

Inasmuch as this project is mainly within the city, I cannot foresee any agricultural problems.

Sincerely yours,

John T. Macdonald
Commissioner

JTM/ebp

EXHIBIT 10

United States Department of the Interior

NATIONAL PARK SERVICE

NORTHEAST REGION
143 SOUTH THIRD STREET
PHILADELPHIA, PA. 19106

REPLY REFER TO:

L7427
NER(CF)

AUG 21 1972

Mr. John Wm. Leslie
Chief, Engineering Division
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

We regret the delay in responding to your letter requesting our comments on the proposed Park River Local Protection Project. As far as we can determine, no historical sites of Federal, State or local concern are affected by this project. We would, however, suggest you contact the Hon. John F. X. Davoren the State Liaison Officer for Historic Preservation to confirm our determination.

Sincerely yours,

David A. Kimball

David A. Kimball
Chief, Federal, State & Private
Agency Assistance

EXHIBIT 11

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
FEDERAL BUILDING
1421 CHERRY STREET
PHILADELPHIA, PENNSYLVANIA 19102

IN REPLY REFER TO:

JUL 0 5 1972

Mr. John Wm. Leslie
Chief, Engineering Division
New England Division, Corps of Engineers
424 Trapelo Road
Wlatham, MA 02154

Dear Mr. Leslie:

This is in response to your letter of June 19, 1972 regarding the proposed Park River Local Protection Project in Hartford, Connecticut. We are presently unable to conduct a detailed study of this project and we have no comment at this time.

The opportunity to review and comment on your proposal is appreciated.

Sincerely yours,

Earl C. Nichols

Earl C. Nichols
Assistant Regional Director, Planning
and Land and Water Resource Studies

EXHIBIT 12

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

AREA OFFICE
999 ASYLUM AVENUE, HARTFORD, CONNECTICUT 06105

AREA OFFICES
Boston, Massachusetts
Hartford, Connecticut
Manchester, New Hampshire

REGION I
REGIONAL OFFICE
BOSTON, MASSACHUSETTS

September 11, 1972

IN REPLY REFER TO:

1.2PMR-2

Mr. John William Leslie, Chief
Engineering Division
Department of the Army
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

Subject: Proposed Park River Local Protection Project (NEDED-R)
Hartford, Connecticut

This office has reviewed the proposed Park River Local Protection Project submitted June 19, 1972. We have no comments concerning the proposed project.

Sincerely,

Daniel P. Kolesar
Director
Operations Division

EXHIBIT 13

STATE OF CONNECTICUT

PUBLIC WORKS DEPARTMENT

STATE OFFICE BUILDING · HARTFORD, CONNECTICUT 06115

July 3, 1972

IN REPLY REFER TO
NEDED-R

Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Attn: Mr. John Wm. Leslie
Chief, Engineering Division

Dear Mr. Leslie:

Thank you for your letter of June 19, 1972, requesting our comments regarding the Park River Local Protection Project in Hartford, Conn.

This department has no comments in reference to the proposed project. We are therefore forwarding a copy of your letter to the Department of Environmental Protection for their information and possible comments.

Very truly yours,

Edward J. Kozlowski

Edward J. Kozlowski
Public Works Commissioner

EXHIBIT 14

GREATER HARTFORD FLOOD COMMISSION
11 ASYLUM STREET
HARTFORD, CONNECTICUT 06103

TELEPHONE 522-9208

Commissioners
HAROLD F. KEITH
GEORGE B. KINSELLA
JAMES V. MURRAY
JOHN C. PARSONS
H. WARD PINNEY
LYONEL H. PUTNAM

April 15, 1969

HAROLD F. KEITH
Chairman
GEORGE B. KINSELLA
Vice Chairman
H. WARD PINNEY
Secretary
PHILIP C. SMITH
Director
ALEXANDER A. GOLDFARB
Counsel

Colonel Frank P. Bane
Division Engineer
U. S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Bane:

Your request of 24 February 1969 that the Greater Hartford Flood Commission, acting for the City of Hartford, reaffirm its assurance of local cooperation in "the project for flood protection on Park River, Connecticut" as authorized under Section 203 of Public Law 483, 90th Congress, has been reviewed by this Commission.

The Commission has directed that I provide you with such assurance in the manner prescribed as follows:

"This will certify assurance of capability and willingness of the Greater Hartford Flood Commission to provide the requirements of local cooperation or reimbursement outlined in your letter of inquiry regarding the Park River project. These requirements will be provided at the time requested by the Division Engineer, U. S. Army Corps of Engineers, in accordance with applicable legislative authority governing the project."

Very truly yours,

Harold F. Keith
Chairman

M
cc with original

EXHIBIT 15

APPENDIX B

PROJECT COST AND ESTIMATES

APPENDIX B

PROJECT COST AND ESTIMATES

PARK RIVER LOCAL PROTECTION

CONNECTICUT RIVER BASIN

HARTFORD, CONNECTICUT

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APPENDIX B

PROJECT COST AND ESTIMATES

PARK RIVER LOCAL PROTECTION

CONNECTICUT RIVER BASIN

HARTFORD, CONNECTICUT

1. CONSTRUCTION COSTS - Principal construction items were estimated on the basis of a preliminary design, the plans, sections and details of which are shown on plates following the text of the report. A summary of the total cost of the project including Federal and non-Federal costs, estimated at $53,000,000, is shown in Table B-1. A detailed breakdown is shown in Table B-4. The feature of lands and damages includes the additional costs for resettlement and acquisition as required under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P. L. 91-646. The cost estimate also reflects a small increase over the last reported estimate in the PB-3 of 1 July 1972, in which the project first cost was $51,800,000.

2. UNIT PRICES - Unit prices at the 1973 price level are based on average cost for construction of comparable conduit projects in the Greater Hartford area.

3. CONTINGENCIES, ENGINEERING AND OVERHEAD - The construction and relocation cost estimates have been increased 20 percent to cover contingencies. Costs of engineering and design, and supervision and administration, are estimated lump sums, based on experience, evaluation of the site and project, and comparison with similar projects in the area.

4. INTEREST DURING CONSTRUCTION - Accrued interest during construction is computed on the basis of a three-year construction period. This was derived by multiplying the total construction expenditures by the 3.25 percent interest rate and by one-half of the construction period in years. The Federal and non-Federal investment costs including accrued interest during construction are shown in Table B-2.

5. ANNUAL CHARGES - A breakdown of annual charges is shown in Table B-3.

a) Interest and Amortization - The project is considered to have an economic life of 100 years. Interest is computed at 3.25 percent

amortized over a 100-year period. The Greater Hartford Flood Commission furnished satisfactory assurances by letter dated 15 April 1969 in conjunction with the Water Resources Council's policy on revised interest rate for water resources projects. This letter is included as Exhibit 15 in Appendix A. More recent concurrence and willingness to participate in the construction of the project is expressed by the Greater Hartford Flood Commission in their letter of 2 June 1972, included as Exhibit 4 in Appendix A.

b) Maintenance and Operation - This item is estimated on the basis of experience with other similar projects in the area. Included are costs for maintenance of the project structures and for operation of the project during periods of flood conditions. Also included are operational procedures of the sluice gates and pumps and other permanent operating equipment and gages. In determining the operation and maintenance annual charges, estimated at $50,000, a 100-year economic life was used for the project.

c) Major Replacements - An allowance of $40,000 as shown in Table B-3, is made for the replacement of items deemed to have a usable life of less than the 100-year life of the over-all project.

6. LANDS AND DAMAGES - This item reflects the cost to local interests for lands required for the conduits, temporary construction easements, relocation assistance to occupants, and severance damages. A detailed breakdown of lands and damages is given in Table B-4. The conduit extensions will be constructed within the banks of the streams. The auxiliary conduit will be constructed principally within street rights-of-way. Where the conduit passes under private property, permanent easements will be secured. Local interests will be required to provide spoil areas; however, it is anticipated that, at the time of construction, fill will be in demand and surplus material from the project construction may be sold.

The entire project will require that about 12 acres be taken in permanent easement, of which about 9.5 acres are required for the auxiliary conduit subsurface easement. An additional area of about 9.5 acres has been acquired in fee by the Greater Hartford Flood Commission. Approximately 24 acres will be required for temporary construction easements of which about 9 acres are of public ownership and 15 acres of private ownership. A two-story brick garage will be acquired, and 5 paved parking areas will be affected during construction.

7. RELOCATIONS - Costs shown in Table B-4 include replacement by local interests of paving, sidewalks and other appurtenances at the four

locations where existing bridges will be replaced by the conduit extension. Also included is the relocation of the existing 54-inch sanitary sewer line which is adjacent to the location of the proposed extension, section 9, above Farmington Avenue. At a number of locations, the drains, sewers, and utilities will require relocation outside the area required for construction of the conduits.

TABLE B-1

ESTIMATED FIRST COST

SUMMARY

Non-Federal		
Lands and Damages	$	1,100,000
Relocations		500,000
Total non-Federal First Cost	$	1,600,000
Federal		
Pumping Stations	$	1,400,000
Conduit Extension		17,500,000
Auxiliary Conduit		25,300,000
Engineering & Design		3,900,000
Supervision & Administration		3,300,000
Total Federal First Costs	$	51,400,000
TOTAL FIRST COST	$	53,000,000

TABLE B-2

ESTIMATED TOTAL INVESTMENT

Federal		
First Cost	$	51,400,000
Interest During Construction		2,500,000
Total Federal Investment	$	53,900,000
Non-Federal		
First Cost	$	1,600,000
Interest During Construction		78,000
Total Non-Federal Investment	$	1,678,000
TOTAL INVESTMENT	$	55,578,000

TABLE B-3

ESTIMATED ANNUAL COSTS
(100-YEAR LIFE)

Federal		
Interest & Amortization on Investment (.03388 x $53,900,000)		$ 1,826,000
Non-Federal		
Interest & Amortization on Investment (.03388x $1,678,000)	$ 57,000	
Major Replacements	40,000	
Maintenance & Operation	50,000	
Total Non-Federal		$ 147,000
TOTAL ANNUAL COSTS		$ 1,973,000
TOTAL ANNUAL BENEFITS		$ 2,948,000
BENEFIT-COST RATIO		1.5 to 1.0

TABLE B-4

DETAILED COST ESTIMATE
(1973 Price Level)

01. Lands and Damages

Conduit Section 9, Fee and/or Permanent Easement:		
Private Lands	$	207,000
Improvements		20,000
Severance Damages		50,000
Temporary Construction Easements Public and Private Lands		315,000
Auxiliary Conduit Permanent Easements on Private Properties		50,000
Administrative Costs		15,000
		657,000
Contingencies, 15%		100,000
Relocation Assistance		43,000
Lands previously acquired by Local Interests		300,000
Total - Lands and Damages	$	1,100,000

02. Relocations

Replacement of:		
Broad Street	$	40,000
Flower Street		40,000
Laurel Street		40,000
Farmington Avenue		40,000
Relocation of Existing Utilities		80,000
Relocation of 54" Sanitary Sewer		180,000
Contingencies		80,000
Total - Relocations	$	500,000

Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
13. Pumping Stations				
Riverside Station:				
Structure	1	Job	L. S.	$ 400,000
Mechanical and Electrical Equip	1	Job	L.S.	270,000
Armory Station	1	Job	L.S.	500,000
				1,170,000
Contingencies				230,000
				1,400,000
30. Engineering & Design				100,000
31. Supervision & Administration				100,000
Total - Pumping Stations				$ 1,600,000
15.1 Conduit Extension				
Preparation of site	1	Job	L. S.	25,000
Clearing and Grubbing	1	Job	L. S.	10,000
Control of River	1	Job	L. S.	500,000
Underpinning & protection of existing structures	1	Job	L. S.	125,000
Maintenance & control of traffic	1	Job	L. S.	60,000
Removal of buildings	1	Job	L. S.	35,000
Removal of bridges	1	Job	L. S.	30,000
Excavation				
Earth, general	190,000	c. y.	$2. 00	380,000
Rock, structure	43,000	c. y.	8. 00	344,000
Rock, trench	1,800	c. y.	15. 00	27,000
Borrow & Place				
Random Fill	160,000	c. y.	2. 00	320,000
Pervious Fill	140,000	c. y.	3. 00	420,000
Gravel Fill	14,000	c. y.	5. 00	70,000
Broken Stone	9,000	c. y.	10. 00	90,000
Conduit				
Reinforced concrete	78,000	c. y.	120. 00	9,360,000
Access manholes	10	ea.	1700. 00	17,000
Furnishing & driving piles	100,000	l. f.	17. 00	1,700,000
Side drains	10,000	l. f.	8. 50	85,000
Drain chambers	1	Job	L. S.	100,000

	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
	Drainage Facilities				
	R. C. Pipe	1	Job	L. S.	370,000
	Manholes	1	Job	L. S.	75,000
	Catch Basins	1	Job	L. S.	15,000
	Storm Siphons	1	Job	L. S.	185,000
	Sanitary Siphons	1	Job	L. S.	65,000
	Seeded Topsoil	12,000	c. y.	7.00	84,000
	Rem. & Replace Utilities	1	Job	L. S.	60,000
					14,552,000
	Contingencies				2,948,000
					17,500,000
30.	Engineering & Design				1,600,000
31.	Supervision & Administration				1,300,000
	Total - Conduit Extensions				$ 20,400,000
15.2	Auxiliary Conduit				
	Preparation of site	1	Job	L. S.	15,000
	Maint. & control of traffic	1	Job	L. S.	75,000
	Control of water	1	Job	L. S.	150,000
	Underpinning & prot. of bldgs.	1	Job	L. S.	75,000
	Excavation				
	Earth, general	68,000	c. y.	2.00	136,000
	Earth, tunnel	28,000	c. y.	34.00	952,000
	Rock, structure	26,000	c. y.	8.00	208,000
	Rock, tunnel	145,000	c. y.	34.00	4,930,000
	Borrow & Place				
	Pervious Fill	28,000	c. y.	3.00	84,000
	Gravel Fill	2,000	c. y.	5.00	10,000
	Random Fill	24,000	c. y.	2.00	48,000
	Furnishing and driving steel sheet piling	100,000	s. f.	6.00	600,000
	Tunnel support steel	6,000,000	lbs.	.50	3,000,000

Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
Rock bolts	25,000	l.f.	8.00	200,000
Steel lagging	40,000	l.f.	4.00	160,000
Liner plate-tunnel in earth	1,100,000	lbs.	.50	550,000
Concrete, mass	3,000	c.y.	80.00	240,000
Concrete, reinforced	30,000	c.y.	120.00	3,600,000
Concrete, tunnel lining	60,000	c.y.	80.00	4,800,000
Grout, tunnel in rock	1	Job	L.S.	200,000
Removal and replacement Water lines, Sewer lines, Drainage facilities & Utilities	1	Job	L.S.	900,000
Access manhole	2	ea.	2,500.00	5,000
Replacement of highway Pavement and sidewalks	1	Job	L.S.	60,000
Seeded topsoil	1	Job	L.S.	6,000
Cofferdam	1	Job	L.S.	75,000
				21,079,000
Contingencies				4,221,000
				25,300,000
30. Engineering & Design				2,200,000
31. Supervision & Administration				1,900,000
Total - Auxiliary Conduit			$	29,400,000
TOTAL PROJECT FIRST COST			$	53,000,000

ATTACHMENT

ENVIRONMENTAL STATEMENT

PREFACE

The attached Final Environmental Statement dated 16 July 1971 filed with the President's Council on Environmental Quality on 1 September 1971 accompanies this Phase I submission of the General Design Memorandum as required by ER 1110-2-1150, Appendix A, paragraph 2i. Data included in the Final Environmental Statement reflects information available as of 16 July 1971.

Since the Final EIS was completed, effort prior to and during Phase I Plan Formulation has produced new data and changes not reflected in the Final EIS, such as the extension of the conduit north of Farmington Avenue. Those data and changes will be reflected in the updated Final Environmental Statement as indicated in ER 1110-2-1150, Appendix A, paragraph 3i.

Section K of this Design Memorandum presents environmental data available at the time of preparation of the memorandum.

16 July 1971

Environmental Statement

Park River Conduit

Hartford, Connecticut

Prepared by
Department of the Army
New England Division, Corps of Engineers
Waltham, Massachusetts

Park River Conduit, Hartford, Connecticut

( ) Draft (X) Final Environmental Statement

Responsible Office: U.S. Army Engineer Division New England, Waltham, Mass.

1. Name of Action: Park River Conduit
(X) Administrative ( ) Legislative

2. Description of Action: The proposal calls for expansion of the present conduit system of the city of Hartford, Hartford County, Connecticut. This includes additional conduit construction, the addition of a junction structure and a headwall on the North Branch, and auxiliary conduit from the junction structure to the Connecticut River and another pumping station.

3. a. Environmental Impacts: The project will have beneficial effects on flood control, water quality, pollution, sewage disposal, aesthetics, land and water traffic, recreation and urban development.

b. Adverse Environmental Effects: No adverse environmental effects are identifiable.

4. Alternatives: Additional reservoirs, modification of existing reservoirs, diversion of portion of South Branch of the Park River, channel encroachment lines, protection plans and "no development."

5. Comments Received:

Bureau of Sport Fisheries & Wildlife
Federal Water Quality Adm.
Bureau of Outdoor Recreation
State of Conn. Water Resources Comm.
State of Conn. Dept. of Agriculture and Natural Resources
Greater Hartford Flood Commission

6. Draft statement sent to CEQ 7 April 71
Final statement sent to CEQ _____

1. Project Description. The Park River watershed drains 78.7 square miles from the mouth of the river at Hartford, west to its headwaters. The Park River is formed by the confluence of the North Branch and the South Branch of the Park River in the west central portion of the city of Hartford, Connecticut. The river flows easterly 2.2 miles through the center of the city of Hartford and discharges into the Connecticut River about a half mile north of the Charter Oak Bridge. The lower 5,600 feet of the Park River was enclosed in a double barrelled reinforced concrete pressure conduit in 1944, in order to protect the low level areas of the city from floods caused by Park River run-off and Connecticut River backup.

Since 1944, a large population increase has been experienced, resulting in the expansion of Hartford and its suburbs into formerly unsettled and rural areas of the Park River Basin. New commercial areas, highways and industrial expansion have accompanied that growth, resulting in destruction of natural storage and increased run-off characteristics in the basin. During the August 1955 record flood, serious flooding and damage were experienced upstream of the 1944 conduit entrance in the city of Hartford.

The proposed project entails an expansion of the present conduit system. Included are four sections of twin barrelled reinforced concrete conduit enclosing 3,716 feet of the Park River and its north and south branches. These join conduit sections previously built by the Corps of Engineers and the city of Hartford. In addition, a junction structure, and a headwall on the North Branch are proposed. An auxiliary conduit of circular cross section having a 22-foot inside diameter and a length of 9,100 feet is proposed, to extend from the junction structure to the Connecticut River. A pumping station is also proposed to pump low level drainage into the conduit in times of flood.

Authority for the project is granted under the Flood Control Act of 1968.

The benefit to cost ratio is 1.3.

2. Environmental Setting Without the Project. Hartford is the capital and the most populous city in the State of Connecticut. The proposed project is located entirely within the city limits. The environment is, therefore, urban in character. As is the case in most contemporary urban areas, few vestiges of a natural environment remain. The urban environment present is typical of that in any large city, characterized by pavement, residences, business buildings, industrial structures and the appurtenances which are coincidental with them.

The existing system of conduits passes through this urban environment. Unfortunately, there are gaps in the system, with the result that water flows through deep concrete-lined open channels. That condition results in low aesthetic values and a high hazard probability, the latter evidenced by the deaths of seven children between 1942 and 1968.

In addition to this, a 1,600 foot open channel between the southern end under Capitol Avenue and Signourney Street and the northern end of the South Branch Conduit is presently endangering the stability of the high river bank within a public park and adjacent streets. Due to storm runoff and the attendant erosion, the settlement and bank slippage has become so serious that this park area has been closed to the public.

3. The Environmental Impacts of the Proposed Action. The impacts of the project on the natural environment would be negligible because the Park River is already partly enclosed in conduits, only minimal vestiges of a natural environment remain and no possibility exists for a reversal in the urbanization process and a restoration of the natural environment. The appearance of the pumping station and headwall may be aesthetically unpleasing, however, the connecting sections of conduit (3,716 feet) will improve the aesthetic quality of the area by eliminating the open channels. The auxiliary conduit would be installed almost completely under existing streets, hence the aesthetic quality of this area would not be impaired. The conduit network would have a beneficial effect on the water quality by cutting down on material added to the river from erosion in the areas of open channel.

The project will also have beneficial effects on the living conditions of the area. The elimination of the hazardous open channels would allow more area to be available for development, as business, residential or recreational areas. In particular is the park area mentioned earlier that had to be closed down because of the dangers created by an open channel. The increased prospects for business and recreation will have a beneficial effect on the local economy.

Overall, the proposed network of conduits, together with the pumping station and headwall would minimize the danger of flooding in the low lying areas of Hartford, along with the destruction and hazards associated with flooding. The elimination of the open channels would result in an upgrading of the urban environment and the possibility of improving pedestrian traffic and aesthetics with the addition of walkways and benches over the new conduits. Therefore, the net effect of the project to the existing environment would be beneficial.

4. Any Adverse Environmental Effects Which Cannot Be Avoided Should the Plan Be Implemented: No adverse environmental effects are known or anticipated if the project is implemented.

5. Alternatives to the Proposed Actions: A thorough study of alternative solutions to the Park River problem was made. Such alternative solutions were:

a. Additional Reservoirs: The construction of flood control reservoirs in upstream tributaries of the Park River was studied as a method of providing flood protection for the lower, built-up, flood-prone areas in Hartford. A comprehensive study of topographic maps, supplemented by field reconnaissance, revealed that the desirable sites have been utilized by the Department of Agriculture for floodwater-retarding structures, and that certain of the remaining sites considered were too far removed from the industrial and urban damage centers to provide any significant reduction in flood levels or to warrant further study. Other sites were abandoned when it was found that reservoir construction requiring acquisition of high value residential properties would be more costly than alternative flood control improvements in the lower basin. Thus this approach was eliminated.

b. Modification of Existing Reservoirs. A review of the eight ungated upstream detention reservoirs being constructed by the Department of Agriculture was made with a view towards introducing modifications which would allow them to be utilized for floodwater retention rather than only for retardation. It was found that the cost involved in accomplishing the necessary structural modifications would exceed the anticipated downstream benefits. Thus, this approach was impractical.

c. Diversion of Portion of South Branch, Park River. Two possible means of diverting the flood flows of the South Branch, Park River were investigated. Either plan would be more costly than providing conduit capacity in the lower basin, and would add to flood flows in adjoining basins. Thus, this approach was impractical.

d. Channel Encroachment Lines. The State Water Resources Commission has established channel encroachment lines from the outlet of the Soil Conservation Reservoirs downstream to Albany Avenue on the North Branch, Park River. Plans for the establishment of similar lines are being considered for the South Branch along with channel modification. Establishment of these lines will be of value from a long range point of view by controlling the construction of new structures in flood-prone areas and thereby reducing future flood damages. However, this program does not relieve present development from the impact of a standard project flood (SPF), which is defined as a synthetic flood used by the Corps of Engineers to measure the flood potentialities of a river basin. This SPF is used as a basis for the design of the flood control projects. Based on 1955 Park River basin conditions, the SPF would be 24,900 cfs (cubic feet per second) at the Riverside Street gauging station. The flood of record in August 1955 resulted in a discharge of 14,000 cfs.

e. Protection Plans. Plans to supplement the conduit work now under way were studied. They included those measures that would be effective in a standard project flood. Construction of walls and dikes along the banks and a pumping station to intercept drainage was one plan considered. This plan would approximately equal the cost of conduit construction without the added benefits to be derived from enclosing the river. However, conduit extension work alone would not be adequate with a standard project flood, due to the limited discharge capacity of the existing Park River conduit. The most practical solution to the problem consists of completing the conduit extensions and adding an auxiliary conduit to provide protection from a standard project flood. Further extension of the North Branch conduit upstream of Farmington Avenue, as suggested by the Greater Hartford Flood Commission, was considered and found not economically justified at this time.

f. No Development. Foregoing any development will not create any beneficial results to the environment, rather some adverse effects would result. First, deterioration and erosion would continue in the open channel areas, especially after heavy rainfalls. Second, the low lying areas of Hartford would not be afforded additional protection from floods. Third, prospects for further urban development in these areas would not be increased.

All alternatives would entail greater disruption and destruction of the environment than the proposed plan.

6. The Relationship Between Short Term Use of Man's Environment and the Maintenance and Enhancement of Long Term Productivity

The project would enhance the long term productivity of the present environment, in terms of the variety of development types possible, the prevention of major flood losses, the enhancement of the appearance of the area involved, and the elimination of hazardous conditions. Specifically a combination of the above factors would result in greater prospects for further development of the area involved for business, residential and recreational use. A case in point is the park area, previously mentioned that is being jeopardized by one of the open channels. Implementing the project would reopen this park area to the public for recreational purposes. The preservation of park areas, especially in a large city such as Hartford, is indeed a beneficial long term result. Another point is that the conduit system would improve long term water quality by reducing the amount of eroded material added to the river. All these factors would favor long term productivity as measured by sociologic and economic advantages.

7. Any Irreversible Commitment of Resources Which Would be Involved in the Proposed Action : The natural resources once present in the project area were committed long ago to economic and urban development. The degree to which they were committed is evident in the fact that only vestiges of the natural environment remain. Consequently, the only resources that would be committed if the project be implemented would be the labor involved to complete the improvements.

8. Coordination With Other Agencies: Coordination has been maintained throughout the course of the study with Federal, State and local agencies which have responsibilities or interests in the project. Included were the following:

Fish and Wildlife Service
Federal Water Quality Administration
Bureau of Outdoor Recreation
State of Connecticut Department of Agriculture and Water Resources
State of Connecticut Water Resources Commission
Greater Hartford Flood Commission

A draft of the environmental statements was furnished to the Bureau of Sport Fisheries and Wildlife. Federal Water Quality Administration, Bureau of Outdoor Recreation, State of Connecticut Water Resources Commission, State of Connecticut Department of Agriculture and Natural Resources, Greater Hartford Flood Commission and the city of Hartford.

This statement has been revised to include agency comments, the major points of which are summarized below:

a. Bureau of Sport Fisheries and Wildlife:

Comment: The project will not have any adverse effects on fish and wildlife resources but will not offer any opportunity to benefit these resources.

b. Federal Water Quality Administration:

Comment: The project will have no major adverse effects on the water quality. Long term beneficial results will be realized by the reduction in amount of bank slippage and subsequent erosion.

c. Bureau of Outdoor Recreation:

Comment: Discussion of the human environmental factors, overall long term consideration and aesthetic considerations should be enlarged.

Response: The statement has been expanded to include greater discussion of these areas.

d. State of Connecticut, Water Resources Commission :

Comment: The first paragraph under Item 3 on Page 3 is not easily understood.

Response: This section of the statement has been revised.

Comment: In paragraph 5d, the statement 'Plans for the establishment of similar lines are being considered for the South Branch" is partly true. For the most part, areas that do not have the encroachment lines are being considered for modification primarily consisting of channel modifications.

Response: This additional information has been noted and is now incorporated in the statement.

Comment: The effect of the project on the sewerage system should be reviewed during the detailed design.

e. State of Connecticut, Department of Agriculture and Natural Resources:

Comment: Since the area was committed to urban development long ago, the conduits will do little to deteriorate the existing environment.

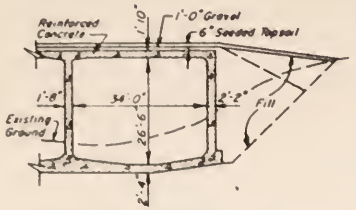
f. Greater Hartford Flood Commission:

Comment: We completely endorse your statement as expressed.

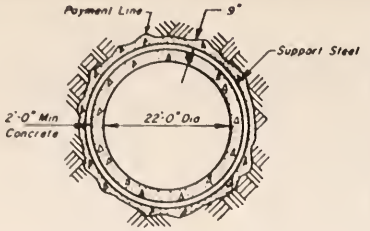
Comment: At present, one of the open channels is endangering recreational areas in a public park. The extent of this danger has reached a point where this area in question had to be closed to the public as a safety precaution.

LEGEND

- [NONE] WORK COMPLETED AS OF 30 JUNE 1970
- [NONE] WORK PROPOSED WITH FUNDS AVAILABLE FOR FY 1971
- [NONE] WORK PROPOSED WITH FUNDS REQUESTED FOR FY 1972
- WORK REQUIRED TO COMPLETE THE PROJECT AFTER FY 1972
- APPROXIMATE LIMIT OF 1955 FLOOD

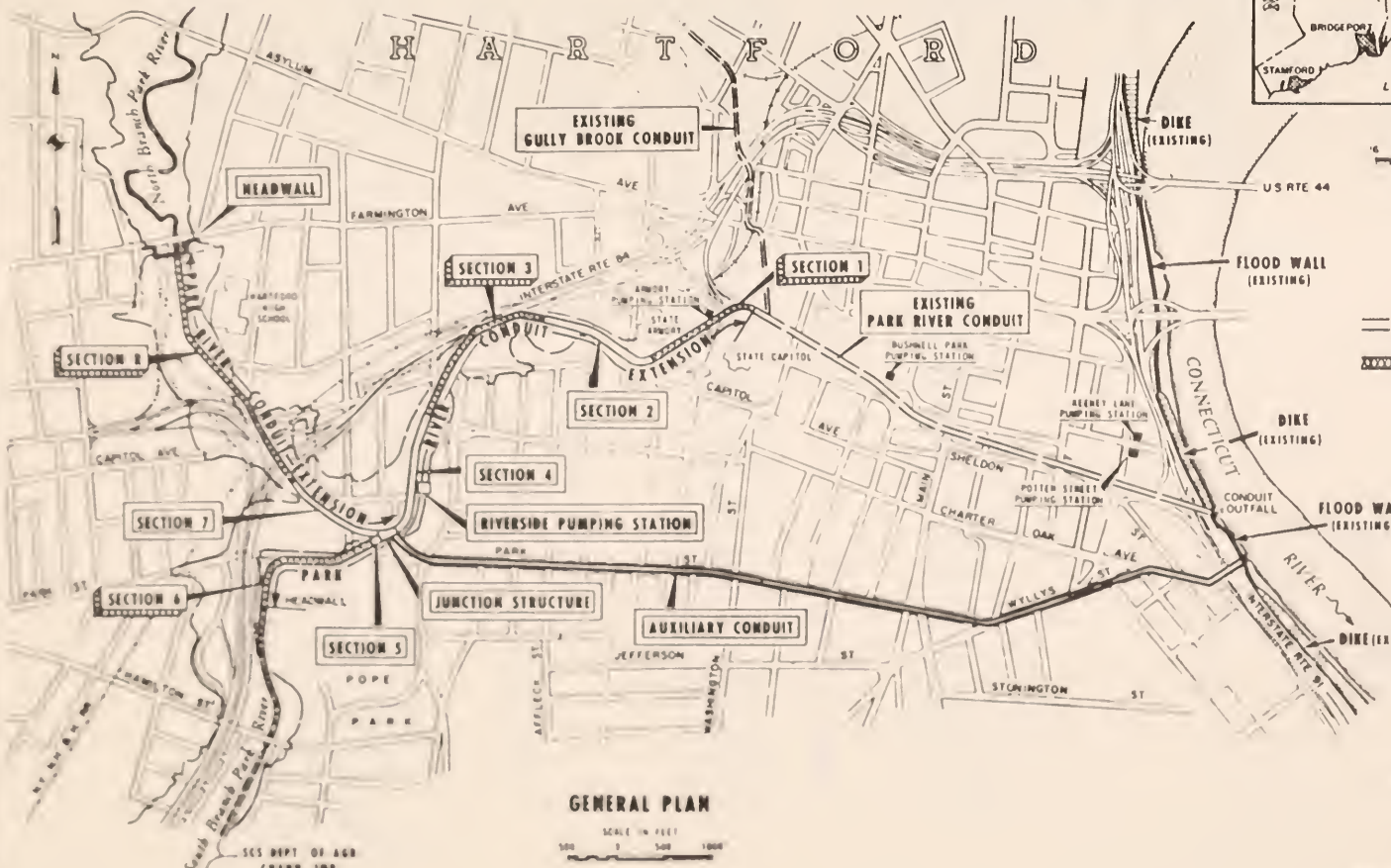


CONDUIT EXTENSION
TYPICAL HALF SECTION
(NOT TO SCALE)



SUPPORTED
AUXILIARY CONDUIT
TYPICAL SECTION - TUNNEL IN ROCK
(NOT TO SCALE)

LOCATION MAP
SCALE IN MILES
16 0 16 32



GENERAL PLAN
SCALE IN FEET
500 0 500 1000

EXISTING PROJECT

GREATER HARTFORD FLOOD COMMISSION COMPLETED OR UNDER CONSTRUCTION

CONNECTICUT RIVER
FLOOD CONTROL PROJECT

PARK RIVER
CONDUIT EXTENSION

PARK RIVER HARTFORD, CONN.

1 JANUARY 1971

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
U. S. POST OFFICE AND COURTHOUSE
BOSTON, MASSACHUSETTS 02109

DEC 4 1970

Division Engineer
New England Division
U. S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts

Dear Sir:

Mr. Leslie's letter dated September 3, 1970 requested our comments on a draft of the Environmental Statement for the Park River flood control local protection project in the city of Hartford, Hartford County, Connecticut.

3a. Identify "the Environmental Impacts of the Proposed Action"

The views of this Bureau should be included; viz, that this project will have no adverse effects upon fish and wildlife resources and it offers no opportunity to benefit these resources.

3c. Identify "Alternatives to the Proposed Action"

We understand that you plan to delete the dollar values relating to benefits foregone. We agree with this.

At such time as your statement in final form reaches the Secretary of the Interior for comments, we undoubtedly will be called upon to respond. Experience has shown that time allowed for such response may be as little as 3-4 days. If your policies and procedures will permit, we would appreciate receiving a draft of your statement as it is sent up through channels. This would give us a little lead time and allow us to prepare a more meaningful input to the Secretary's comments.

Sincerely yours,

ACTING Regional Director

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
Northeast Region
John F. Kennedy Federal Building
Boston, Massachusetts 02203

January 8, 1971

Mr. John Wm. Leslie
Chief, Engineering Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

With reference to your letter of September 3, 1970 transmitting environmental statements on 19 projects for comment, and to our letter of October 20, 1970, there are enclosed our comments on an additional eight projects.

Comments on the remaining projects will follow as soon as possible.

FOR THE REGIONAL DIRECTOR:

Sincerely yours,

Edward J. Conley
Federal Activities Coordinator

Enclosures:
Environmental Statement Comment - Westerly, Rhode Island
" " " Danbury, Connecticut
" " " Bristol Harbor, Rhode Island
" " " Hartford, Connecticut
" " " Fitchburg, Massachusetts
" " " Charles River Dam, Massachusetts
" " " Fitchburg and Lunenburg, Massachusetts
" " " Beaver Brook, New Hampshire

ENVIRONMENTAL STATEMENT COMMENT

HARTFORD, CONNECTICUT

PARK RIVER

The proposed project will consist of the construction of reinforced concrete conduit sections, a junction structure, a pumping station and a headwall.

As the project does not involve a major watercourse or significantly alter those factors affecting water quality, no major adverse water quality change should be realized. The project will have a beneficial effect on water quality over the long range by reducing the amount of bank sliding and subsequent erosion.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
FEDERAL BUILDING
1421 CHERRY STREET
PHILADELPHIA, PENNSYLVANIA 19102

IN REPLY REFER TO:

November 13, 1970

Colonel Frank P. Bane
Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Bane:

This will provide further response to Mr. John Leslie's letter of September 3, 1970. As requested, our letters of September 30 and October 20, 1970 and this letter provide our comments on draft environmental statements transmitted by Mr. Leslie's letter for the following projects:

1.	Baker Brook	Fitchburg, Massachusetts
2.	Beaver Brook	Keene, New Hampshire
3.	Bristol Harbor	Bristol Harbor, Rhode Island
4.	Charles River.	Boston, Massachusetts
5.	Cliff Walk	Newport, Rhode Island
6.	Danbury	Danbury, Connecticut
7.	Dickey-Lincoln School	St. John River, Maine
8.	Fall River Harbor	Rhode Island and Massachusetts
9.	Ipswich River	Ipswich, Massachusetts
10.	New London	New London, Connecticut
11.	Nookagee	Westminster, Massachusetts
12.	North Nashua River	Fitchburg, Massachusetts
13.	Park River	Hartford, Connecticut
14.	Phillips	West Fitchburg, Massachusetts
15.	Saxonville	Framingham, Massachusetts

16.	Stratford	Stratford, Connecticut
17.	Trumbull Pond	Trumbull, Connecticut
18.	Westerly	Westerly, Rhode Island
19.	Whitmanville	Whitmanville, Massachusetts

We believe that each of the above draft environmental statements is lacking a full discussion of the human environmental factors which are related to the proposals. In many cases it appears that significant natural or physical resources may be involved but no attempt has been made to present an analysis of plan formulation considerations which led to the recommended development scheme. The draft statements have recognized the existence of human, natural, and physical resources but we would recommend that your statements be expanded to include an evaluation of the potential impact of your proposals on such resources.

We also believe your draft statements have failed to give satisfactory consideration to the overall long term consequences which could result from development. In many cases it would be necessary to project or estimate what these consequences might be but we believe such an assessment can be an important part of any environmental statement and recommend that this be done where appropriate. Your statement should include an analysis of current and expected future trends in effected land uses and the many related social and cultural factors which would be important to an understanding of the total impact of the project. Examples of such factors which you should consider in determining those which might be pertinent to the project are population growth, urban growth, transportation systems, resource development plans and industrial expansion. The presentation of your impact statement should be coordinated with current plan recommendations of the public agencies which have prepared plans for areas which would be affected by your proposals.

The draft statements are noticeably lacking in discussions of the aesthetic considerations related both to the proposed developments and to the planned operation of the projects.

Generally, it appears to us that your approach to the preparation of these statements has been defensive in nature. We believe that acceptance of this approach is not consistent with the objectives of national environmental legislation. We now have tools needed to assist us in the offering of preventive solutions to environmental problems. In each of your proposed projects a public need is defined and serving this need appears to be your goal. Your estimates of the project economics is evidence in itself that serving this need is a valid objective. It is important to note, however, that other public needs may very likely be critical. The

implementation of plan measures which were developed primarily on the basis of economic considerations could predetermine that even a remedial solution to an environmental problem recongized at some future time would be ineffective. We believe a more satisfactory result would be obtained if a positively oriented discussion were made of the many factors related to each project which you have determined to be a major Federal action. In like manner this approach should extend to an adequate treatment of a full range of project alternatives.

In order that the above comments on your draft environmental statements might be better understood, we have prepared as examples more specific comments for selected individual projects, as follows:

Saxonville Local Protection

Recognition and discussion in this statement of the loss or modification of a natural stream environment through channelization measures is recommended. It appears also that you have recognized a valid alternative to the recommended project, involving evacuation of the flood plain and supporting measures, but complete discussions of this and other alternatives are not made.

Baker Brook Channel Improvement

More detailed discussions are needed which relate current land uses to the problems of bank erosion, stream pollution; low stream flow and siltation of the channel which you have identified. If this is done, a more complete discussion of practicable alternatives could be presented and a clearer understanding of the potential impact of the project on outdoor recreation or aesthetic values could be made apparent.

Fall River Harbor, Massachusetts and Rhode Island

The description and discussions of the impact which this project will have on the human environment should include detailed consideration of the relationship between this proposal and land use or open space plans for the project area. There is no discussion of the closely related project which you refer to as "a land relocation project scheduled by the City of Fall River to create 40 acres of waterfront property."

Your statement indicates that "there are several aspects of the project which could represent irreversible and irretrievable commitment of resources but the factors governing these are questionable at this time." We believe that such a finding without additional discussion as to the full range of possible adverse affects is not compatible with the intent of P.L. 91-190. A fuller explanation of spoil disposal and its effects should be made, and we believe that the discussion of possible alternatives and environmental enhancement opportunities is woefully lacking.

Bristol Harbor, Rhode Island

The statement should include a more complete explanation and analysis of the effects on the natural environment of changing the circulation pattern in the harbor. An explanation of the studies made of the circulation patterns, and the project effects on the circulation patterns, could enable a better understanding of the lack of knowledge with respect to any changes and also, perhaps, some idea of the probability that changes might take place which could adversely affect the aesthetic or outdoor recreation values of the harbor area.

We also believe some discussion is needed regarding the commitments that would be necessary from other non-Federal public agencies in order that a pollution problem not be further magnified by the project. It would assist in understanding the possible consequences of the project if you would also discuss or suggest possible means to obtain any needed commitment, or alternatives to such commitment.

Hurricane Protection, Stratford, Connecticut

A major result from implementing this project would appear to be to make existing marsh lands near the project an attractive area for future land fill operations. The strong inducement which this would offer for the pursuit of economic gain could more than counterbalance an expressed environmental concern at the level at which decisions would be made. The results of your studies have caused you to advise local interests "to restrict future development in the marsh thus preserving the ecological value of the marsh." You suggest with or without the project the marsh will be lost to filling operations. This does not appear to us as a satisfactory end result of project planning and analysis. A fuller discussion of various alternatives and the possible consequences of each is necessary. It would appear that in each case some recognition would be needed of the required permit procedures which must be adhered to prior to initiating filling activities. This project offers a good example of a "cause and effect" relationship over which good control of the result is possible if thorough study is made of the ramifications of the project prior to any final decision on a plan.

Charles River Dam, Massachusetts

The draft statement for this project provides another example of what we believe is a lack of consideration of the cumulative long term impact of the proposal. The project is presented as a first step measure to a "satisfactory solution to the flood problems in the Back Bay Fens and on Muddy River." No effort is made to provide additional discussion of possible related proposals, each of which will have an identifiable impact on the environment. A similar observation relates to the proposal for construction of a highway viaduct crossing the Charles River.

Dickey-Lincoln School Reservoirs

This draft statement, as well as others under discussion here, tends to equate environmental impact to identified project benefits. In so doing, the statements fail to provide a long term assessment of potential adverse and beneficial environmental impacts. Presented as it is, the statement fails to provide any consideration of other pertinent land uses in the area which would be influenced by the project. We believe that a more quantitative description could be made of the total impact of a project of this magnitude on a relatively untouched area. Alternative plans which could serve the needs associated with these projects should be presented along with a similar detailed descriptive analysis of the impact which these measures would have on the environment.

We have prepared these comments on the basis of the information provided in your draft environmental statements. Detailed studies of your proposals or field reviews of the project areas have not been conducted.

We are pleased to have had the opportunity to provide this technical assistance to you and we hope our comments will be useful as you further develop your environmental statements.

Sincerely yours,

Rolland B. Handley
Regional Director

STATE OF CONNECTICUT

WATER RESOURCES COMMISSION

STATE OFFICE BUILDING • HARTFORD, CONNECTICUT 06115

May 19, 1971

Division Engineer
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Sir:

Reference is made to your Draft of Environmental Statement concerning the Park River Conduit, Hartford, Connecticut dated March 26, 1971. We have reviewed the draft statement and suggest the following changes or corrections.

The first Paragraph under Item 3 on Page 3 is not easily understood and in any case seems to serve little purpose and we suggest that it be omitted. The following paragraphs amply cover the subject of Item 3.

In Paragraph 5d, certain statements relating to the channel encroachment line program as applied to the Park River Watershed are made. The statement in the middle of the paragraph which reads, "Plans for the establishment of similar lines are being considered for the South Branch.", is only partly correct. It is also true that lines have been established along certain tributaries of the South Branch including a total milage of approximately 15.75 miles of river. For the most part those areas in which lines have not been established include reaches of river which are under consideration for modification by the installation of flood control improvements consisting principally of channel modifications.

There is reason to be concerned with the effect of the project on the Metropolitan District Commission sewerage system, but such can not be assessed on the basis of available data. It is felt that the need for review will be appropriately accomplished during detailed design.

We trust that these remarks will be of value to you in reaching your final decision as to the composition of the Environmental Statement.

Very truly yours,

Charles J. Pelletier
Division Engineer
Water Resources Management

CJP:d

STATE OF CONNECTICUT
DEPARTMENT OF AGRICULTURE
AND NATURAL RESOURCES
STATE OFFICE BLDG. HARTFORD

OFFICE OF
COMMISSIONER
JOHN T. MACDONALD

April 20, 1971

Mr. John W. Leslie
Chief, Engineering Division
Department of the Army
New England Division,
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts

Dear Mr. Leslie: Re: NEDED-R

We have reviewed the draft of the Environmental Statement for the Park River Conduit in Hartford, Connecticut which you submitted to me with your letter of March 26, 1971.

We wish to advise you that we concur with your statement. The Park River in the area of the proposed conduit was long ago committed to urban development and is of little or no value to fish or game. The proposed conduit will do little or nothing to deteriorate the environment.

Sincerely yours,

John T. Macdonald
Commissioner

JTM:ksm

GREATER HARTFORD FLOOD COMMISSION
550 MAIN STREET
HARTFORD, CONNECTICUT 06103
TELEPHONE 566-6666

missioners
HAROLD F. KEITH
GEORGE B. KINSELLA
JAMES V. MURRAY
JOHN C. PARSONS
H. WARD PINNEY
LYONEL H. PUTNAM
WILLIAM J. REYNOLDS

HAROLD F. KEITH
Chairman
GEORGE B. KINSELLA
Vice Chairman
H. WARD PINNEY
Secretary
GEORGE E. HEPPNER
Director
ALEXANDER A. GOLDFAI
Counsel

April 2, 1971

Mr. John Wm. Leslie, Chief
Engineering Division
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

This will acknowledge receipt of your letter of March 26, 1971 and the enclosed "two draft copies of the environmental statement for the Park River Conduit Project."

Our review of your statement's assessment of the potential environmental impacts of our project results in our complete endorsement of the statement as expressed.

By way of comment on Paragraph 2 - "Environmental Setting Without the Project", may we point out that one gap in the existing conduit system - the section between the south end of the conduit under Capitol Avenue and Sigourney Street and the northerly end of the South Branch Conduit, north of Park Street - approximately 1600 lineal feet of open Park River channel is presently endangering the stability of the high river bank within a public park and streets adjacent thereto. Storm runoff through this open channel, and attendant erosion have caused settlement and bank slippage so serious that this whole park area has been closed to the public.

Closure by conduit of this particular gap will stabilize this high bank, prevent further hazardous slides, and permit extension of the public park area and facilities by the development of the conduit right-of-way.

May we hope that submission of this environmental statement for the Park River Conduit Project will provide the needed leverage for the approval of this project within the immediate future.

Very truly yours,

George E. Heppner

George E. Heppner
Director

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